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THE INSTITUTIONAL ACTIVITIES OF AMERICAN CHILDREN.

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The paper here presented is the outgrowth of an interest enkindled by a study of Froebel's "Education of Man." It was undertaken in the hope that it might be able to throw additional light on the pedagogical value of games,—an important educational factor sometimes lost sight of in our modern devotion to the technique of formal instruction. The social activities of childhood have been approached from three lines of attack. An individual biographical study has been carried out at great length. Such a study furnishes opportunities for careful psychological analysis, something impracticable by the remaining methods. Secondly, a topical syllabus covering the most important lines of interest was issued. This supplied material by which the merely local and personal peculiarities of the first study might be checked off; also many of the confessions were of much more frank a nature than those of children. Lastly, the children themselves were appealed to, and, by a series of compositions, an attempt was made to estimate the relative value of the different factors in the child-life of to-day. In addition to the empirical studies a brief survey of some of the leading adult societies for children is included. A brief survey of the literature of the subject is appended. The paper deals only with the period of childhood, or from the years from four to fourteen, although a continuation of the study through the period of adolescence is projected.[1]

[1] I take this occasion to express my obligations to Dr. G. Stanley Hall for his many suggestions, without which the article in its present form would have been impossible. I am also indebted to the criticism

PART I.

Study of Children's Compositions.

The best approach to the subject is through a discussion of the results obtained from children's compositions. This section aims to afford a broad, general view of children's spontaneous societies in their quantative relations. The succeeding sections of the paper will contain an analysis of the results here obtained.

The test given was short and simple in character. The children were directed to write a composition or language exercise on some society or club. The only qualifying condition was that the club should be one which they had organized themselves without adult assistance. The teachers were enjoined from assisting, suggesting or in any manner influencing the pupils. The test was given in all of the grades of the school at the same time, and to prevent communication between the pupils concerning the exercise, it was given unexpectedly. The children were led to believe that the work was for their teachers and had no clue to its true purpose.

Responses were collected from five cities: Manchester, New Hampshire; Chicopee and Springfield, Massachusetts; Stockton and Santa Rosa, California. Thus the two extremities of the country, New England and the Pacific States, are represented and the two extremes of rural and metropolitan life have been avoided. 2,906 children were given the test. Of the returns 398 were defective in certain particulars, in a majority of cases the age of the pupil being omitted, they were in consequence useless for the purposes of the investigation.

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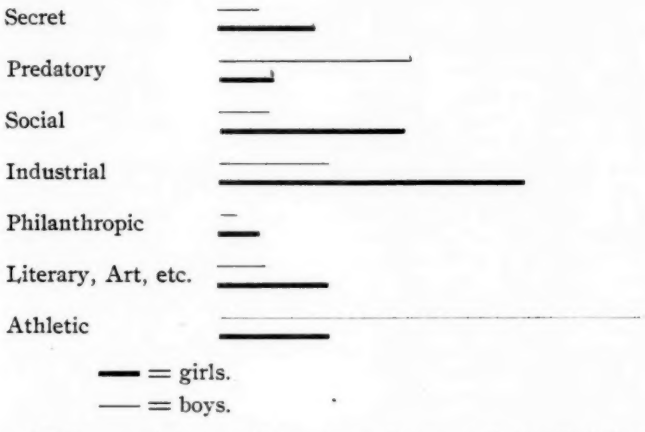
of Dr. W. H. Burnham, of Clark University, to Mr. Frederic L. Burk and Prof. Will S. Monroe, of Westfield. Prof. Earl Barnes has furnished valuable material. The statistical study of children's papers was only feasible through the co-operation of Superintendents E. M. Cox, of Santa Rosa, California; J. M. Barr, of Stockton, California; George Winch, of Manchester, New Hampshire; Clarence Brodeur, of Chicopee, Massachusetts, and Miss Fannie B. Gates, of Springfield, Massachusetts. Among those who have sent in valuable responses to the questionnaire are, Mrs. Hattie Mason Willard, of Escondido, California; Prof. Everett Shepherdson, of the Los Angeles State Normal; Prof. Charles J. Bennett, of the San Jose State Normal; Miss Margaret Schallenberger, of Stanford University; Miss Estelle M. Darrah, of the Mankato State Normal School, Mankato, Minnesota; Miss Lillie A. Williams, of the New Jersey State Normal, Trenton; Prof. M. H. Scudder, of New Haven, Connecticut; Prof. Oscar Chrisman, of the Emporia Kansas State Normal, and Miss Alma Patterson, of Riverside, California.

I also desire to thank the secretaries of the various children's societies for their uniformly courteous response to numerous requests for information. I have been especially aided by Dr. William Byron Forbush, of Winthrop Church, Boston, who has placed his valuable collection of material at my disposal.

CHART SHOWING SEX DIFFERENCES.



Of the remaining 2,508 responses, 810 or 32% signified that they had never belonged to such organizations, although a great majority expressed a willingness to do so if opportunities presented themselves. As would be expected, the proportion without such experience was much higher during the earlier years of childhood.

Although the test called only for the spontaneous organizations of children, in many cases the limitation was disregarded. 641 pupils wrote accounts of organizations in which adult influence was apparent, the great majority of these consisted of church and philanthropic societies. It is worth noting that a distinct sex difference is here shown to exist. While the number of the two sexes writing was approximately equal, 384 girls gave responses of this type as against 257 boys. The tone of the papers differed, the girls being decidedly more enthusiastic than the boys.

Of children's organizations, there remained 1,166. The classification of these was a task of no small difficulty, owing to the lack of clear or definite ideas in the minds of the writers. Some clubs seemed to include almost every line of activity. These, however, were fortunately few in number, and were left to the last, when the collator had his previous experience as a guide. They, however, introduced an unavoidable personal element into the tabulation. Of the 1,166 papers, some 40 might be classed as complex. The remaining papers seemed to fall into the following seven classes:

1. *Secret Clubs.* Under this head were collected all clubs of whatever nature having secret features. While the majority were for the purpose of having a good time, this was by no means universally the case. Clubs to prevent swearing, societies for trout fishing and literary organizations, all had their secret features. The number of secret societies appeared to be much smaller than was anticipated. As will be seen by the accompanying charts, this class of societies remained a fairly constant element during the ten years recorded, and was characterized throughout by a large feminine preponderance.

2. *Predatory Organizations.* These represent the migratory, building and out-of-door instincts, and include bands of robbers, clubs for hunting and fishing, play armies, organized fighting bands between separate districts, schools or sections of a town or city, as well as associations for building houses, forts, etc. Organized games are reserved for a succeeding section. The predatory organization is the typical association of small boys. After twelve years of age boys transfer their interest from these loose, predatory bands, to more definitely constructed athletic clubs. This form of children's organization is peculiar, liable to perversions, which will be dealt with at length in the next section. Reference to the charts shows that predatory organizations belong to boys, and are strongest in the earlier years.

3. *Social Clubs.* They represent that element in childhood which insists on having a good time, and are the most immediate outgrowth of the social instinct. In many cases their promoters frankly confess that their chief object in organizing was to create an excuse for holding parties, picnics and the like. This is one of the favorite girls associations, they outnumbering the boys in the ratio of five to one. It is a fairly constant element during the ten years represented in the study, and forms slightly more than ten per cent. of the total.

4. *Industrial Associations.* This form introduces the element of personal advantage. The most common forms are sewing circles, giving shows, collecting clubs and playing store. This is the strongest of all the girls associations. The ratio is 187 to 59 in their favor, and the type is a uniform factor through childhood. It has often subordinate philanthropic features, as in case of a girl's sewing society, which meets primarily to sew, and then incidentally helps the poor.

5. *Philanthropic Associations.* Here we have two forms. The first consists of societies, the chief object of which is to help other people. This form predominates. Secondly, there are clubs organized for mutual help against such vices as using slang, swearing, smoking and the like. Such organizations are but slightly represented, numbering only 22 girls and 11

TABLE

Showing the growth of children's social interests from 8 to 17. Collated, 2,284; defective, 398; refused to write, 224; grand total, 2,906.

AGE	8	9	10	11	12	13	14	15	16	17	
	53	**78**	**119**	**167**	**199**	**205**	**150**	**104**	**30**	**16**	**1115**
No. of papers collected	50	67	127	189	208	224	119	96	44	13	1139
	35	**53**	**95**	**133**	**187**	**173**	**120**	**72**	**38**	**12**	**911**
No. of societies reported	28	44	118	155	164	188	90	80	34	11	934
	22	**26**	**38**	**35**	**37**	**33**	**36**	**35**	**25**	**7**	**294**
No. not belonging	25	26	31	49	54	49	25	17	14	3	292
	1	**2**	**5**	**5**	**10**	**6**	**3**	**0**	**4**	**3**	**37**
No. reporting more than one	1	1	13	11	11	11	6	5	5	1	66
	3	**5**	**10**	**7**	**18**	**12**	**7**	**3**	**4**	**0**	**67**
No. having secrets	0	0	5	4	3	2	5	3	1	0	23
	4	**5**	**3**	**0**	**7**	**1**	**1**	**3**	**1**	**0**	**25**
No. of predatory societies	4	2	17	31	18	22	(11)	7	1	0	111
	0	**5**	**8**	**20**	**22**	**15**	**16**	**11**	**7**	**1**	**104**
No. social clubs	0	0	1	5	7	5	4	2	2	2	28
	5	**10**	**20**	**31**	**54**	**36**	**16**	**9**	**5**	**1**	**187**
No. industrial organizations	1	2	8	17	11	9	6	2	1	2	59
	0	**1**	**0**	**2**	**4**	**6**	**5**	**5**	**0**	**0**	**22**
No. philanthropic associations	1	0	1	0	4	1	2	1	1	0	11
	0	**1**	**1**	**5**	**8**	**5**	**15**	**7**	**7**	**6**	**65**
No. literary, art and musical clubs	0	0	0	3	2	4	4	5	5	5	28
	1	**1**	**4**	**10**	**8**	**15**	**12**	**5**	**10**	**2**	**69**
No. clubs athletic games	7	20	52	61	75	78	49	44	17	3	406
	20	**25**	**44**	**56**	**66**	**73**	**40**	**32**	**9**	**2**	**384**
No. adult societies for children	14	19	32	41	45	69	20	20	7	0	257

Boldface figures=girls. Lightface figures=boys.

boys. For obvious reasons it has been impossible to chart them. While every precaution was taken to exclude from this rubric, all societies to which the slightest suspicion of adult influence was attached, yet, owing to the brevity of some papers, there may have slipped in such clubs without evidence. A reasonable suspicion may be attached to a number of these papers.

6. *Organizations for the Promotion of Literary, Artistic and Musical Training.* As the curve on the chart indicates, this form of organization belongs more properly to adolescence than childhood. It plays a very unimportant part until the age of 15 is reached. Here, as in the two previous classes, the girls lead the boys in the ratio of more than 2 to 1.

7. *Athletic Clubs.* Including general athletic clubs, football, baseball and cycling clubs. This is the strongest of all the forms of organization here presented. It is the boys' association, par excellence, they outnumbering the girls at the ratio of more than 5 to 1. Reference to the curve shows its increasing popularity until the last year is reached, where the small number of papers invalidates the conclusion. The papers show that these clubs, once organized, are more abiding than the previous forms of association, and mean more to the children involved. They are taken more seriously, and bring in the elements of co-operation and subordination to a larger extent. From these facts it would seem that they tend toward a more valuable form of social training.

Conclusions.

While the present study is not sufficient in itself to justify any generalization or criticism of the prevailing forms of children's organizations in America, it may be well to summarize what appear to the writer to be some of its chief conclusions.

1. American children left to themselves organize. This organizing tendency is rather unevenly distributed and large numbers of children are out of its sweep, but it still exists, and in the smaller cities of the country includes the majority of the children. Whether this tendency is common to childhood in all lands or peculiar to America and the downward reflection of our democratic institutions, is a question only to be answered by the study of large numbers of children elsewhere, the small amount of biographical data collected seems to support the latter hypothesis. A close inspection of the papers, and a correspondence with students of childhood throughout the country, supports Tarde and Baldwin in their view that imitation is the all-important factor in the social process. This conclusion can only be stated tentatively here, but will be enlarged upon in the following section.

2. Girls take much more kindly than boys to societies organized by adults for their improvement; they also show much stronger altruistic tendencies than boys.

3. Girls are more nearly governed by adult motives in forming their organizations than boys. They organize societies to promote sociability, to advance their interests, to improve themselves and others. Boys are nearer primitive man; they associate to hunt, fish, roam, fight, and to contest physical superiority with each other.

4. With the exception of clubs for having good times, holding parties, etc., boys and girls are but seldom together in their organizations. This generalization does not apply to the country districts.

5. Secrecy plays but a minor role in the institutional activities of the American child.

PART II.

Reminiscent Papers.

In order to secure a more favorable opportunity for the study of the social instinct genetically, another method of approach was resorted to. A topical questionnaire (No. 16 in the Clark University Series for 1897–98), treating of the more common forms of children's associations was issued with a request that all experience of any value in tracing the idea be included. The syllabus called for as exact details as possible concerning: adult stimulus, duration of the society, methods of choosing leaders, causes of dissolution, and numerous other important details. 453 reminiscences were received in response to this circular.

Period of Imitation.

In a majority of the reminiscences, the years of childhood from four to fourteen contain two distinctly marked periods: the first of these stages, lasting in many cases until the age of ten years, may be characterized as the period of free spontaneous imitation of every form of adult institution; the child responds easily and sympathetically to his environment. He reproduces in his games and miniature associations as exact a copy as possible of the life around him. In the case of one boy, whose life history has been made a special study, the response to external social stimuli at different periods has been most marked. From four to seven placed on a farm, his play time was spent in raking and threshing leaves, in constructing tiny fences and building barns and corrals. At seven, removed to the sea shore, he immediately makes ships and harbors and turns the gutter into a lake. Later, being isolated in the city, surrounded by an adult library he reads history and dreams of

wars and battles; the back yard is covered with fortifications, the dead almond blossoms as they fell from the trees were marshalled into opposing hosts. Boys in groups play in the same manner. The Corbett-Fitzsimmons prize fight was the signal for an outbreak of pugilistic enthusiasm among the boys of the entire country. The present war with Spain has called into existence thousands of military bands among the school boys. Stamp collecting spreads in much the same manner as the latest popular song.

Many cases of direct imitation have been noted in the returns, a few of which are included.

In a New Jersey school the teacher reads an Indian story on Friday afternoon. All the succeeding winter the school played a game, in which the pupils were divided into two tribes of Indians who waged war during the recess.

In Connecticut, bands of robbers and armies were organized "after what some one had read in some book."

Another observer writes: "There was no outside stimulus to the movement, the fights were modeled as nearly to the storming of forts in history as the boys were able to understand."

A teacher reports that having studied the wars of the United States in their classroom, the boys divided themselves into two snowball armies representing the North and the South.

An additional observation reads that boys from eight to ten, who belonged to a band of robbers, "got their ideas from books."

Vast masses of similar testimony might be cited.

Playing Family.

To appreciate the full force of the imitative impulse, one must study the daily life of the average child. Perhaps the most common form for very young children and girls is playing house or family. Many observers testify that the reproduction of the one particular family with which the child is best acquainted, is exact even to the most minute details. Scarcely a reminiscence has been received which does not enter into this earliest and most fundamental of the social processes.

A girl of 17 writes of her early childish experience: "We had a mother, father and children. Sometimes two or three families were formed so that we had cousins and aunts. We used to dress up in any clothes we could find and go to see them, and go out riding and walking. We used to get up family gatherings and parties, and have meals just as any family."

Another girl of 18 years observed a little boy of four years and a little girl of three, who always played father and mother, the dolls being their children. The wife can never get her husband to mind the children. He will walk out and say: "Have my dinner ready when I come back." The other day he told her to have beef-

steak. She said: "I can't fry beefsteak; you'll have to do it yourself." The boy said: "Papas don't fry meat." The little girl responded: "Yes they do, for my papa did one day." The boy finally had to give in and let her cook something else.

PLAYING STORE.

The American child, like his father, seems to devote his best energies to industrial undertakings—the most common form of which is playing store. Of all forms of social amusement this seems to delight children most. "One of the games I delighted in. The most interesting of anything I ever played." These are expressions typical of the attitude of the average American child. This game varies in complexity from the lemonade stand in the front yard to the elaborate industrial machinery of the miniature community immortalized in President Hall's "Story of a Sand Pile." Some typical returns are epitomized as follows:

G., 16. "The play-room was like a little town all by itself. There were paper houses and barns furnished even to the minutest article, and stables filled with animals of every type and grace. The church was a huge wooden clock, which was made to strike just before the services. Our people were conveyed about in carriages, in the toy train or by means of cars made to go back and forth across the room. Our money we made on rainy days. The bills were cut from green paper, the pennies and silver from cardboard. We took great pains and interest to make them as nearly as possible like the actual."

G., 14. "We had a great deal of fun building our store, for we wanted it just like a real one. When we had finished building it we would gather leaves and grass and other things to sell. Then we appointed one of the children for storekeeper, one for bookkeeper, another for errand boy, and one for mother. We were never tired of playing store, and would often keep it up a whole morning."

B., 11. This youth and a friend formed a stamp society, and issued 15 shares. Of these they kept 8, paying for only one, however, and sold the remainder. A flourishing business soon resulted, but the remaining stockholders complained that the promoters had not paid their share. A cash capital was suggested, but as the stamp fad was on the decrease it was thought better to auction off the stock on hand and dissolve the corporation. The auction netted a 60% dividend on two months' work.

PLAYING CHURCH.

The imitation of religious services are not as common as games of the two preceding classes. This is probably due to the fact that the multitude of religious agencies formed exclusively for children, obviate for vast numbers the need of attending regular services. One reminiscence in three, on the average, makes mention of this game. In case of young children it is purely a game, as the following witnesses testify:

B., 5. Gathered the chickens together in the back yard and would preach to them.

G., 16. "When I was about six or seven years old, my sister, my

brother and myself used to hold prayer meetings. We did not have any special object in doing this, but simply thought it a rather grown-up thing to do. The only object I remember in playing prayer meeting, was to see which one of us could best imitate the older people. We also tried to see who could talk the loudest and longest."

G., 18 at 9. "When I went to school we girls used to play prayer meetings. We had gone to Methodist prayer meetings and revivals and observed the earnestness displayed, and we would imitate the proceedings at school, which we thought very amusing."

G., 17 at 7. The children started a prayer meeting, and they used to lead the meeting and pray and sing. The leaders were chosen by the girls and boys. The rough ones had to lead the meetings as well as the good ones. The organization was closely copied after adult prayer meetings. The society lasted for quite a long time, but was finally broken up because the older persons did not think it was right.

The transition from such pure imitations to organizations involving something of individual inventiveness and purpose is easy as the child advances in years. A record of a society involving strongly the latter element comes from the daughter of a missionary in Asia Minor.

G., 16. "We called the society the H. O. A., these letters standing for the words help one another. The purpose of its members was to help one another to be good. Their age varied from eight to twelve. Every week the society met at one of the homes and held a prayer meeting. Their was a collection taken, which was given to the poor. The members took turns in conducting the prayer meetings, which were the same in form as ordinary church prayer meetings. All who joined pledged themselves to be as good as possible. If they should forget their promise at any time, and should quarrel or engage in any impiety, that member of the society who should happen to see the deed was expected to remind the wrong doers by saying H. O. A. At the sound of these magic words the sinners were expected to desist from breaking the promise. If not they were liable to be expelled. Our parents knew nothing about it until it was well started."

Exceptional Cases of Imitation.

The preceding paragraphs outline the most common forms of social imitation of American children, but by no means exhaust the list. Playing school is treated in a paper soon to appear, by Mr. D. E. Phillips. A lonely, or abnormal or particularly imaginative child may imitate anything which comes within the range of his experience or reading. A number of these out-of-the-way imitations have been collected, of which a few samples are given.

A girl of eleven organized the worship of Pallas Athene. There was a deep ravine with a stream of water. In a broad place in the stream, there were two large flat rocks. On the bank a young sycamore grew from an old stump. This was Pallas Athene, and the flat rocks the scene of her worship. (Pallas grew from the head of her father Zeus.)

There was a court consisting of a king, queen and subjects.

There was also a priest who officiated at sacrifices. The king and queen wore golden rod upon their heads and waded in the streams, attended by their subjects, and gathered lovely flowers for Pallas Athene, and caught cray fish, which were duly smashed upon her altar. Sometimes there was a special celebration, when, in addition to the slaughtered cray fish and beautiful flower decorations, and pickles stolen from the dinner table, there would be an elaborate ceremony.

The same girl organized a witch's band, which met at a deserted log cabin, and carried on an elaborate witch ritual. This band, because of its uncanny doings, was intensely disliked by the people in the neighborhood.

A country boy of ten, and much given to reading history, would, when picking up potatoes, throw them in heaps, and would explain to his companions that a certain heap was Athens and another Sparta. When asked why each was so named, he would point to some small physical peculiarity, like a rock for the Acropolis, as a defense of his characterization.

Form of Organization.

Many of these games have a formal institutional organization. Presidents, secretaries and treasurers are chosen with exceedingly faint ideas of their respective functions. Before the age of ten such officers are chosen simply because children want their societies to appear like those of their parents.

A girl of 16 writes as follows: "When I was about nine years old a secret society was formed in the school. It was called the independent society of young people. We had a treasurer, secretary and president, though we never seemed to think of them as having any special duties."

From a girl of 18: "When they wanted a constitution, they appointed a member to write it for them. This member went home and looked through a chest of papers belonging to her father, until she found an old constitution of an organization to which her father belonged. She copied this constitution, changing some of the words to suit their own little society. Although they had this constitution, they very seldom paid any attention to it. If they wanted to do certain things, they would do it whether the constitution allowed them to or not. The only reason they had a constitution was because they thought they must have one in order to become a society."

Caste Feeling.

From the evidence at hand, it would seem that the feeling of caste reaches its culminating point of expression about the end of the tenth year. Among very young children, it is almost wholly absent. Girls become acquainted with social, racial and industrial differences through their mothers; boys from their associates. While its expression in the form of bullying and teasing, as might be supposed, is more intensive among

boys, the feeling of exclusiveness and pride appears much stronger in girls. Girls, if so told by their mothers, think themselves too good to play with girls of the working classes or of alien nationalities. Boys, on the contrary, will often run away and disobey parental injunctions to get a chance to play football and baseball with boys of any nationality, Italians, Jews, Irish and even negroes. Although the papers are all from the northern States, negroes are mentioned most often as being victims of caste feeling.

Some examples of individual reactions are presented:

G., 23. Children have an idea that wealthy people are better than poor people, that ministers are superior to others, that American people are superior to foreigners, that colored people are degraded.

G., 18. "I have observed that children distinguish between color and nationality. A few distinguish between the wealth of a person."

G., 18. "I don't think little children have any idea of caste, at least very few; only those who have been taught to have one by their elders. Before they go to school, we see them playing with almost any child, whether of different nationality or race, rich or poor. When they enter school they are not particular in selecting friends."

G., 16. Children almost universally have a distinct idea of despising and taunting those whom they consider below themselves in worldly position.

G., 18. Children think more of their position than when older. They feel the difference between themselves and some other child more strongly.

B., 18. In the Christian Endeavor Society of our town, there were two half colored children. The other children continually teased and taunted these two children.

G., 18. Children generally make color and dress a dividing line in society. I have seen children teasing each other because of race and wealth in numerous cases.

Period of Invention.

During the period from ten to fourteen, associations among children assume a new character. There is less of imitation and play and more of invention and the following of instinct. Children strive less to be like adults. Among boys there is a tendency to form social units characteristic of lower stages of civilization. Bands of robbers, Indians, pirates, the wandering soldier companies of the middle ages, furnish the models of these organizations. Although environment determines the degree of diversion, it is present among boys of every degree of culture. The most marked tendency of this reversion is the falling back on the physical ideals of savagery, and their substitution for the ethical and intellectual ideals of the present civilization. As this is the most important of all the spontaneous organizations of children, a rather full account of two or three such organizations will be inserted.

A number of boys about ten years of age organized an Indian club. The badge of the lodge was a tomahawk. The call was

intended to resemble a war-whoop. "The process of initiation was that they put the subject in a guano sack and jumped him up and down and rolled him over and over on the ground. Another process of theirs was to get the subject to get up on a fence, and the chief had a paddle cut full of round holes, and would hit the subject with it. The society tried to follow the ways of Indian camp, and cooked things over a little fire, and had a tent for a meeting place, and wore feathers in their hats. The chiefs wore feathers down their back."

B. "With a number of chums I belonged to a band of prospective robbers at the age from eleven to thirteen. It was known as the Jesse James gang. It was the time when the James boys figured prominently in the papers, and our gang was modeled after the original as closely as possible. The captain was known as Jesse James until the real Jesse was killed, then he insisted on changing his personality and becoming Frank James. We had different quarters during the continuance of the organization; at one time we occupied the garret of an unoccupied building; at another we established headquarters under an empty house, gaining access by burrowing under the foundation; and still later an artificial cave was begun, but not finished, in the woods. Each member had either a real revolver or an imitation of one. Various other weapons were also displayed. The activities of the band were limited to making raids on empty houses, robbing imaginary banks and the like. No real robbery was ever attempted. There seemed to be a distinct line of demarcation in our estimates of the kind of robbery we were imitating, and real thefts we had been taught were wrong."

B., 23. "I remember having belonged to a gang of boys ranging from ten to fourteen years of age. There was no formal organization, but the boy who excelled in the sports was recognized leader. A member had no special qualifications; if he would do what the rest did, he belonged to the gang. A great deal was said about initiation when a new boy appeared in the neighborhood. During the course of a few days the new boy received his 'bumps' several times, besides being put through the paddles and ducked if it were swimming time, and other minor annoyances.

"Often the gang would separate; some of the boys splitting off under the leadership of a rebellious spirit, but eventually consolidating again. If a boy were disagreeable, refused to join in the game or the like, 'he could n't go with us any more.' To us this was a good and sufficient punishment; the offender in every case showed a supreme indifference as whether he went with us or not, but generally returned in a few days. There was great rivalry between our gang and one in another section of the town. No boy could venture into the enemy's territory unless accompanied by a few companions. At nearly every meeting of the two gangs, or sections of them, a stone fight ensued, with the smaller body retreating slowly, with such remarks as: 'Wait till we catch you alone,' or 'Let 's get some fellows and go back.' Each gang reigned supreme on its own hunting ground, and successfully repelled all invasions of the enemy.

"I should have said that the gang generally took its name from one of the leaders, one of the wards, or from some feature of the locality, as the 'Rubber Mill Gang,' 'Johnny Jones and them,' etc. In the winter a club was formed by the gang, the only requisite being a club house in which the members assembled, and really suffered a sort of

martyrdom from cold and smoke, although no one had the moral courage to affirm that more comfort was to be had outside.

"As far as I know the gang exists yet, younger members coming into it all the time, and old members occasionally reappearing to watch the youngsters or chat with companions about former days, and fights and what used to be.

"Although, as I have said, there was no formal organization of the crowd spoken of above, I have often felt what an intense loyalty and *esprit de corps* existed among the boys, who, although they quarrelled and fought among themselves, were always ready to assist comrades against members of another gang. And there is great sympathy between former members and the present crowd, which puts me in mind of the feeling between graduates and their Alma Mater."

Leadership.

As among the North American aborigines, leadership in boys' predatory associations is largely a matter of physical strength and daring. It is, in a vast majority of cases, the boy who can "lick" the other boys, who can throw a stone the farthest, who can ride in the most daring manner, who becomes captain. As the members of the gang are approximately the same age, superior years is an absent factor. Daring sometimes takes the place of physical strength, but the contests are of too primitive a nature to permit intellectual superiority to count for much.

The following are notes from observers:

G., 17. The chiefs on either side were the persons who could run fastest. If they could run fastest, they could take the most scalps, and were therefore the bravest.

B., 20. The best fighter of the boys usually became leader.

B., 19. The toughest boy in each town became leader. They picked out the lad who was strongest and could fight the best.

B., 18. There was no formal organization (of the gang). The best fighter generally took the lead in getting it up, and was recognized as commander.

B., 10. The leader was the one who was the most daring and who could fight any other boy in any other gang.

B., 14. The bravest and most daring always became the leader in these organizations.

B., 15. The leader was the largest and strongest boy in the crowd, and the one that had a great deal of self-confidence and was very daring.

G., 18. The strongest boys were asked to join the fight, and the best fighter was chosen leader. If the boys did not follow the directions of the leader they could not remain in the fort.

Maintenance of Discipline.

Preserving order within the gang is a task of no great difficulty. The basis of selection for leadership explains why this is so. The leader is the embodiment of the ideal of the association. In a band which puts a premium on physical powers, he is the strongest. With few exceptions, he has little diffi-

culty in making his authority felt. His treatment of rebels and malcontents is usually summary and effective.

B., 14. What the leader says is law, and if not obeyed immediately the disobedient person is considered an enemy, and is dealt with as such.

B., 18. If any of the boys did not obey they were cuffed over the ears, and sent home until they got over it.

G., 18. If the members did not obey they were bullied by the other boys.

B., 16. If the members would not conform to the rules of the society they were expelled from it, but not before they had received a good beating from the remaining members.

Outcome of Predatory Associations.

However innocent these predatory bands may be among small boys, when the age of twelve is reached and the predatory function remains primary and is not subordinated to the athletic, they become dangerous. The members are no longer satisfied with mere play, and danger is a spice which exerts more and more of a fascination. The robber knight, the pirate chief, and the savage marauder become real models. A few typical instances from a vast mass of testimony are here given:

B., 16. "There was a band of young boys in our city formed for the purposes of stealing. They were between the ages of twelve and sixteen. They formed it to steal all they could get. They stole milk bottles off people's steps early in the morning, rugs from the door steps, iron car couplers, fruit and vegetables from the stores, and anything else which they could get. They took these things to a den, as they called it, which was an old vacant barn."

B., 15. "The boys of our town often formed in parties and raided the farmers melon patches. There was no formal organization or election of officers."

B., 18. "At my home a good many boys form clubs. When thus banded they steal boards for election day bonfires. One club called itself the 'Gang.' They have no adult stimulus."

G., 17. Reports a society formed to bother a family in the community who were spiritualists. It lasted as long as the members were boys.

B., 18. "There was no formal organization, but there was a planning how, when, and what they should steal. The objects stolen were not trivial, but valuable objects."

G., 18. "I was in the country last year, and several boys were talking about stealing fruit and vegetables. They planned to stick by each other and meet in the woods, bringing with them all they could find. I think they were going to camp there for the summer, that was why they were going to steal."

Similar cases are continually finding their way into the newspapers and police courts.

The *San Francisco Examiner* of February 28, 1898, contains the report of the examination of Roy Palmer, the leader of an organized gang of boy pilferers, the members of which belong to the first families in the city of Salinas, California.

The lads had banded together for the purpose of entering stores and stealing anything they could lay hands on, selling their loot to other people, and plundering them while so doing. They were well organized, with a president, secretary and treasurer. The money received for stolen goods was used to buy candies, gum and ten cent detective stories. Pistols and cartridges were found in a cache where they had been hidden by the boys.

A similar affair is recorded in the *Boston Herald* of March 19, 1898, as follows: "A gang of youthful marauders, twelve in number, living in Wollaston, has been committing a number of petty thefts in that place. It is alleged that the boys abstracted the signal boxes of the New York, New Haven and Hartford R. R., at Wollaston. Houses were entered by the gang, and electric bells and connections stolen. They also broke into the Golf Club of Wollaston, at Norfolk Downs, and a number of golf sticks and balls were stolen from the lockers.

"There are a dozen boys in the gang whose ages range from 8 to 15 years. This embryo Jesse James gang had built a number of huts in the thickets of the lowlands of Wollaston, where they had hidden their plunder. They had utilized the electrical appliances stolen from the houses mentioned to connect the huts for electrical communication. The members of the youthful gang belong to good families, and the injured parties are disinclined to prosecute the offenders."

In the large cities, such gangs have become not only a nuisance, but a positive danger. A thorough study of their working in New York City has been made by Mr. Jacob R. Riis in his valuable work, "How the Other Half Lives." In a few sentences an attempt will be made to outline the principal points in his treatment of the subject. On the East Side, New York, "Every corner has its gang," not always on the best of terms with its rivals in the next block, but all with a common programme of defiance of law and order, and with a common ambition to get "pinched," *i. e.*, arrested, so as to pose as heroes before their fellows. Individually the New York tough is an arrant coward, it is only when he hunts with a pack that he is dangerous. Then his individual vanity makes him forgetful of all fear or caution in his desire to distinguish himself before his fellows—a result of swallowing all the flash literature and pennydreadfuls that he can borrow, beg or steal—and there is never any lack of them—and of a strangely dramatic element in his nature that is nursed by such a diet into rank and morbid growth.

The gangs have their club rooms, where they meet, generally in a tenement, sometimes under a pier or dump, to carouse, play cards and plan their raids. The gangs, like foxes, have

more than one hole to their dens. In some localities, where the interior of the block is filled with rear tenements, often set off at all sorts of odd angles, surprise alone is practicable. Pursuit through the winding ways and passages is impossible. A tenement once pitched upon by the gang with its ear marks of nightly symposiums, "can rackets," in the language of the streets, is on the road to rapid deterioration. Valuable property is often well nigh ruined by being made such a thoroughfare.

Outrages by the gangs are numerous. Within a single week, one spring, the newspapers recorded six murderous assaults on unoffending people committed by highwaymen on the public streets. How many more were suppressed by the police, who always do their utmost to hush up such outrages in the interests of justice, it is impossible to say. Entire neighborhoods are so terrorized that no one dares to testify against the gang. Occasionally their atrocities are appalling. A young lad, who was the only support of his aged parents, was beaten to death, within a few months, by the Alley Gang, simply for being at work, trying to earn an honest living. The state of affairs here described existed in 189 . At present many of the gangs are unorganized, and the East Side is in a state of quiescence.

In England, there has been of late considerable complaint regarding the depredations of similar gangs. The *London Daily Times* of April 10, 1898, refers to certain cities and towns where numbers of youthful ruffians in their teens band themselves together to commit depredations and assaults, sometimes with pistols, and are a perfect nuisance to their neighborhoods. The passing of the rod and the substitution therefor of juvenile reformatories, imprisonment, fines, etc., is held responsible for this outbreak of hoodlumism. Reinstate whipping seems to be the counsel of many charity experts.

These London gangs are more brutal and daring than the similar organizations of New York. Nearly every district has a gang of its own which terrorize the neighborhood and fight among themselves. Each of these gangs, whose members vary in age from thirteen to twenty years, has its bosses, whose authority is recognized and whose commands are implicitly obeyed. The bosses are not formally elected, but attain their position in virtue of their extra daring and general capacity for command. When war is waged, sanguinary and often fatal conflicts ensue. They are battles in which the combatants fight if not to kill, at least to seriously maim each other. Pistols are quite common; knives equally so, and the members of the gang who are not thus armed content themselves with carrying clubs loaded with lead, iron bars and bits of lead piping. A short time back a little girl was shot dead in one of these encounters; while at last session one young ruffian was sent to

penal servitude for six years, while his companions received shorter terms of imprisonment for grave assault on a police constable.

Like the New York toughs, these youths individually feel the greatest dread of a policeman, as indeed they do of any resolute, able bodied man. But in numbers they apparently dread nobody; and thus it is that the police have a difficult and dangerous task when they have to stop such young ruffians from battering one another about and terrorizing the peaceful members of the community.

To solve the problem which presents itself in these extracts, we must turn to the underlying factors. Both the statistical and reminiscent studies point to the existence of an exceedingly strong tendency in boys to revert to immediate physical reactions, which usually takes the form of contests, to determine athletic superiority. This tendency is so strong as to almost furnish the keynote to his education. Athletic games not only supply the boy with his opportunity for physical training, but with a large part of his social training as well. For the best embodiment of this idea of government through organized athletic games, we must turn to the great English public schools. Perverted, this same tendency or instinct forms the gang or predatory which parents are entirely justified in considering a danger for boys between the ages of 12 and 18. All such organizations truly harmful are the outgrowth of the artificial conditions of the modern city or manufacturing town. The natural modes of expression for the physical reaction instinct, the baseball, football and cycling clubs, are impossible for certain large classes of population in the modern American city. Deprived of the natural outlet, boys and youths revert to the ideals and institutions of savagery. This leads to the discussion of one of the greatest defects in American education to-day, viz., the lack of suitable opportunity for the training of the working classes through athletics. It is, however, the function of the present paper to point out the direction of a solution rather than to attempt to deal with the solution itself.

PART III.

Adult Societies for Children.

Within the last thirty years, the social instinct in children has been seized upon as the basis of numerous associations designed to accomplish various adult ends. Of these organizations there are two chief classes. The first may be characterized as the positive or aggressive type. It aims by means of association to inoculate the child's mind with the ethical, social and religious ideas of their parents, their class or their church.

With these ends, modifications of various religious and philanthropic associations have been introduced. Most of the existing organizations are of this type. Recently there has been a change in the point of view, and a second type of children's societies has been produced—the negative. Its object is merely to afford an outlet for the social instinct, and it has no ideals, ethical or otherwise, to inculcate.

Foremost in the new work has been the church. The best representative of the activity of the Protestant denominations has been the Junior and Intermediate branches of the Society of Christian Endeavor. The function of the Junior branch is, in the words of its promoters, "to prepare boys and girls for the active service of Christ." In its main features, it is an adoption of the Senior society; the chief difference being that adult leadership is substituted for self government. The members of the Junior organization take a consecration pledge and possess a working constitution, similar to, though simpler than that of the parent society.

The historian of the Order considers the formation of the Junior societies as the "logical outcome" of the movement. This expression points the way to one of the chief criticisms sometimes passed upon the work, viz., that it is too logical and consistent a copy of the methods of the Senior society. It is said that the organization tends to mechanical imitation. The literature issued from the central office of the society would tend to confirm this view. The plan of campaign minimizes the influence of personality and underestimates the value of leadership in juvenile work. The societies are told that they must not wait for a good leader, but take any one. Experience, however, has shown that the success of these Junior branches is dependent almost exclusively on the personal qualities of the leader. Institutional mechanics are too much emphasized. The Junior departments of the Young Peoples Societies of the other Evangelical Protestant churches, such as the Baptist Young People's Union and the Epworth League are very similar to the Junior Christian Endeavor in organization and methods.

The Roman Catholic church possesses no distinctly children's organization. After confirmation, which usually takes place at the age of 12, the children may be, and in many parishes are, organized into sodalities; this form of organization is, however, by no means confined to children and adolescents. The sodality is governed by a council consisting of a father director, a prefect and two assistants. Among the duties of the members of the sodality are the following: To daily examine their conscience, to recite morning and evening prayers, and to practice the Christian virtues demanded by the duties of their state in life. Once a week the members of the sodality assemble

together and recite in common the little office of the Blessed Virgin Mary (a portion of the ritual to be memorized). Once a month they make their confession and approach holy communion in a body, wearing the badge of the sodalities. Their organization being optional with the priest of each parish, it has been found impossible to collect exact numerical data concerning them.

Another unique form of religious organization for children is that of the boys' branch of the two brotherhoods. One of these, that of St. Andrew, is confined to the Protestant Episcopal church, while the other, dedicated to Andrew and Philip, is interdenominational (Protestant). They differ from the Junior Christian Endeavor and similar societies in being confined to boys. The members are bound by two vows. The rule of prayer requires each brother to pray daily for the advancement of Christ's kingdom among boys. By the rule of service, they pledge themselves to take some part in the work or service of the church and to get other boys to do the same. Both these Orders are distinctively religious in character. Amusements are provided, not for the use of the members, but for the boys they are expected to influence. "They are not a guild or boys' club, but training schools for Christian loyalty. The advantages of the brotherhood idea are two: First, the boys are by themselves; secondly, the element of personal and institutional loyalty; something tangible before the boys and easily comprehended, is insisted upon, rather than ethical principles.

In addition to the church societies there are other organizations based on Christian teaching, but placing the religious element in subordinate position and laying chief stress upon the accomplishment of practical philanthropic work. An excellent example of this sort of institution is the "Ministering Children's League," an international order founded by the Countess of Meath. This society endeavors to accomplish two ends. Primarily it aims to "promote kindness, usefulness, and the habit of usefulness among children." These results are best obtained by giving them some work to do. As a consequence, each member pledges himself "to do at least one kind deed every day." The hand-book of the league emphasizes the gain of immediately attempting some charitable scheme, and directions for making games and packing Christmas boxes are sent to each society. This Order numbers 50,000 members in the United States. The King's Sons, and the children's branch of the Ten Times One is Ten clubs, organized by Edward Everett Hale, carry out a similar programme.

Another class is formed by those organizations which have some one definite social reform in view. Such a society is the

Loyal Temperance Legion, which is under the auspices of the Women's Christian Temperance Union. The members pledge themselves to abstain from alcoholic stimulants and narcotics. The society issues manuals and charts showing the effect of intemperance on the human system. Like the junior branch of the Society of Christian Endeavor, there is a complete institutional organization among the children. In the last five years considerable attention has been devoted to practice in parliamentary law. By its last annual report there were 100,000 members of the legion. The Protestant Episcopal Church, many dioceses of the Roman Catholic Church, and secret temperance societies like the Good Templars, all possess children's organizations devoted to this purpose, and varying in efficiency. Nearly akin to these are the "Bands of Mercy," organized in the common schools for the protection of animals. Their constitution is very simple, consisting of a skeleton of an organization, a pledge and a badge. The Massachusetts Society for the Prevention of Cruelty to Animals, under the leadership of George Angell, has circulated humane literature by the ton through the medium of these Bands of Mercy.

Such is a brief and inadequate sketch of some of the leading forms of adult activity for children found in the country. The movement is assuming large proportions. Children's societies are becoming important weapons of propaganda. At least one child in every three belongs to some such association, and their number and influence are rapidly increasing. From the standpoint of a student of pedagogy what is to be said of their expediency?

An understanding of the subject will be promoted by endeavoring to comprehend the point of view of their promoters. The following justification from one of their oldest exponents, Mrs. Mary Low Dickinson, of the Society of King's Daughers, is inserted for this purpose. In response to the query, shall children early be allowed to become members of religious and philanthropic societies? she writes:

"We would say that any little child is old enough to know that he is sometimes naughty, that he has his little temper and greediness and fretfulness and laziness to struggle with, is old enough to be helped to see those things and be inspired with a desire to overcome them. In other words, the little boy who knows that he is a bad boy and would like to be better, is old enough to be taught that Jesus, his Saviour, is loving and watching and ready to help him to be better, and that he can leave off his naughtiness and try to be good for His sake. One little fellow of four years, on having this explained to him, said quietly that he would have 'to consider it,' and the next day came to his auntie with the statement that he would like to try to be one of the little sons of the King. Whenever his naughty little temper got the better of him thereafter he ran to his mother pulling at his little badge with, 'Take it off quick, mamma, take it off, I am bad.'

"We have all heard of the children who are watching their mothers' faces, and making it their business to let no new wrinkles come; and, without exaggeration, our records contain thousands on thousands of instances in which the selfishness and naughtiness of little children have been overcome by the constant reminder which the little cross was to them, that they must return good for evil, and think and speak no evil of those with whom they had to do."

The question which arises in connection with the instances cited in the above eloquent appeal is: Are these children normal? Are ordinary healthy boys and girls troubled concerning their sins? Have they a passion for altruism? Are they inclined to protect birds and beasts and save their pennies for the pagan children of India or Central Africa? Most of the evidence thus far collected fails to substantiate the position taken by Mrs. Dickinson. Few children's societies organized voluntarily have altruistic features. They are "to have fun," "so we could get together," etc. In response to one of the rubrics of the questionnaire the respondents gave the reasons why, when younger, they enjoyed attending these adult societies for children. In these answers, the music, the picnics, the entertainments, the pleasures of office-holding figured largely, while altruistic reasons were in a small minority, and were limited to girls. It was the universal testimony that such organizations had no charms for the average boy, who seldom attended unless compelled to. This important sex difference, when added to the fact that boys and girls during this period of their lives seldom associate together in their voluntary enterprises, would seem to demand separate treatment and separate organizations for the two sexes.

All the testimony thus far collected bears out the hypothesis that altruism is one of the concomitants of the emotional upheaval of adolescence. It would appear, therefore, that many of the organizations now founded for children rest upon adult ethics and psychology rather than upon any knowledge or study of child nature. Many of these organizations are premature, and when effective produce a growth of hot-house virtues destined soon to disappear. However, their effectiveness is questionable. To a certain slight extent they give the child a social training in manipulating the machinery of organization. But, as a rule, if the responses to the questionnaire are typical, they furnish a meeting place for girls, and to some extent perform the functions of a social club, while boys stay away, or, when compelled to attend, create disturbances which are difficult to deal with.

That this is not a mere academic conclusion is shown by the fact that several groups of the most advanced Christian workers are throwing themselves into the organization of boys' clubs. The Y. M. C. A., which formerly neglected this branch of

their work, are determined at length to put it on an equal footing with other lines of activity. The university settlements have been experimenting with the problem under great difficulty owing to the quality of boys dealt with. Churches and cities are organizing boys' clubs on a sound financial footing. Four lodges for boys, based on what is believed to be a sound analysis of boy character, have been formed. Of these, the Boy's Brigade, a military organization, has attracted the largest share of public attention. Owing to the cost of equipment, the monotony of drill, and the difficulty of securing competent leaders, the organization has but a limited field of usefulness. It has also been objected to with some appearance of reason because of its "jingoistic" tendencies. Another order is that of the "Knights of King Arthur," which aims to perpetuate "our noblest Anglo-Saxon legend." It is a knightly fraternity, not a secret society. Its attractiveness to boys is said to be in its appeal to the love of show and mystery. The Princely Knights of Character Castle and the Coming Men of America, are two secret orders of somewhat similar character. The former has, however, a religious basis, while the latter is purely a business enterprise. All these lodges are increasing their membership with great rapidity. They subject themselves to criticism by the comparatively slight attention they pay to athletics, the strongest interest of boyhood.

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DENDRO-PSYCHOSES.

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To trace one of the relations between mind and its environment backward toward its source is the attempt of this paper. The influence of trees on the life of man is the topic. Why have trees played such an enormous part in the emotional and spiritual life of the race? Why do primitive peoples still worship trees and believe them to be powerful spirits, or the abodes of spirits, which rule the destinies of men? Why have the shrines of early religions been consecrated groves? Why were "the groves God's first temples," and the Garden of Eden a plantation of trees?

Children, too, are lovers of trees and flowers, and bestow on them an amount of attention and even devotion entirely out of proportion to the return they get—judging by our cold scientific standards. Even to-day, among peoples of the most advanced civilization and persons of the highest culture, life-trees are common—planted at the birth of a child, and cared for throughout life by the child, the youth, the man, whose life is believed to be intimately bound up with the life of the tree.

If the use and the beauty of trees are not a sufficient explanation of their influence on our lives, we must seek a reason more internal. If there is nothing in the nature of trees which justifies our thought and feeling toward them, then there must be something in the nature of the mind to justify it. If, for instance, the old belief that trees were spirits were shown by later investigation to be true, there would be nothing strange in the human mind having originally come to that conception. It would be merely a step in the advance of science. On the other hand, when such a notion is found to be entirely inconsistent with science, when the thought finds no justification in the nature of external things, but is none the less entertained by all primitive peoples and not originated by the vagaries of an individual thinker, a reason for its existence must be sought in the mind itself. If present circumstances are not a sufficient reason for present thoughts and feelings, then mind must have been, in some period of its evolution, subject to influences which left an impress that developed into more definite forms of instinct or action. It is not to be expected that any of these can be

traced with certainty to their sources. The path from brute-hood through savagery and barbarism to civilization and culture has been too long and devious to be retraced in thought. But the traveller bears certain marks which indicate the course of his journey, and at some of these we shall take a glance.

There is unquestioned evidence in man's body of his having been, in far-gone ages, a dweller in the trees. We may review briefly the biological facts in support of this.

I.

Biological Evidence.

"Man, with all his noble qualities, with sympathy which feels for the most debased; with benevolence which extends not only to other men, but to the humblest living creature; with his god-like intellect which has penetrated into the movements and constitution of the Solar system;—with all these exalted powers, man still bears in his bodily frame the indelible stamp of his lowly origin."[1]

It is not to-day claimed that man is descended from an ape;—at least not from any existing species, nor yet have any fossil remains been discovered which would connect him with any of the present forms. He has marked resemblances to all the four species of anthropoids, but differences also, so prominent that it would be absurd to call man the issue of any one of them. He seems, moreover, to be not much more closely related to one than to another of these species. "The gorilla approaches nearest to man in the structure of the head and foot, the chimpanzee in important structural details in the skull, the orang in the development of the brain, and the gibbon in that of the thorax."[2] Though none of these is the direct ancester of the human race, yet evolutionists claim that man and the anthropoid apes did have a common origin. It is the "fundamental law of organic evolution" that ontogenetic development follows the line of phylogenetic—, "the history of the germ is an epitome of the history of the descent."[3] "Every creature that lives climbs up its own genealogical tree before it reaches its mature condition."[4] Taking, then, any two individuals whose ancestry had diverged in earlier generations, we should expect to find them resembling each other less and less as they grew toward maturity; just as the two species or genera, of which our individuals were respectively represen-

[1] Darwin: Closing paragraph of *Descent of Man*.
[2] Haeckel: *Evolution of Man*. London, 1879. Vol. II, p. 181.
[3] Haeckel: *op. cit.*, Vol. I, p. 6.
[4] Drummond: *Ascent of Man*, 3rd ed. New York, 1894. p. 72.

tatives, became more and more unlike after separating from the parent stock. At birth the similarities ought to be numerous, since the given individuals were then exhibiting the characteristics of their respective types at a time when these types were not yet widely divergent; in adult life, on the other hand, these similarities would be fewer, as the individuals now represent the present widely separated types. This is exactly what we find in the case of men and apes. The baby ape is much nearer to the human child than the full-grown ape is to the adult man.[1] Extending the comparison, we can of course say that the adult man is farther from the young ape than the mature ape is from the new-born child, because the line to which man belongs has advanced enormously as compared with the ape, from the time of their common ancestry onward, and consequently the child soon passes the highest stage to which the most intelligent of the quadrumana has attained.

This relationship may profitably be followed out, so far as it applies to the arboreal life of man's progenitors, and the comparison just made can of course be extended to embryonic life, as the child recapitulates before birth the greater part of the structural development of the vertebrate series. In all the anthropoid apes the arms are longer than the legs,—notably so in the gibbons, who can easily touch the ground with their fingertips when standing erect. In man, on the contrary, the legs are much longer and larger than the arms. The reason is doubtless because of the relative amounts of work to be done by these members. Man's legs must support the whole weight of his body, and have been developed accordingly, but monkey life being chiefly arboreal, locomotion is largely by means of his hands, and the upper extremities have correspondingly increased in size and strength. But this relation does not hold in the human infant at and before birth; he shows his closer affinity with the lower species, and his earlier mode of existence. The height of the adult is three and a half times that of the new-born child, with arms in the same proportion, whereas the legs are five times as long as those of the child. The approximation of the human infant to the proportions of the anthropoid is still more strikingly shown by comparing measurements at an earlier period. In a fœtus of 8½ inches length the arms are actually longer than the legs, and reach to the knees when the body is erect. At the middle of gestation, therefore, when the proportions most closely resemble those of the anthropoids, the arms grow more rapidly than the body and the legs; in the latter part of the period the legs again

[1] Vogt: *Die Säugethiere in Wort und Bilt*, p. 49.

gain, and at birth are longer than the arms,[1] though not to such an extent as in adult life, which is therefore farther removed than child life from man's nearest allies. In the relative lengths of upper and forearm, also, the infant has not diverged so widely as the adult. Savages show the same relations as children between upper and lower limbs—a relation intermediate between apes and adult Europeans. The forearm of the negro is a little longer actually and relatively than that of the European, and the proportion of arm to leg is greater in the negro.

Not only the length but the strength of the arms at birth is remarkable. The clinging power of infants often surpasses that of adults, and goes to show that our ancestors were tree-dwellers and that the children clung to their mothers whose hands were occupied in climbing from branch to branch. Young apes, as a rule, hang beneath their mothers, holding on by the long hair of their shoulders and sides. Those that failed to do this would tumble to the ground or be left behind and fall a prey to enemies from which the mothers were fleeing. Hence, natural selection would bring about a high degree of this clinging power. Of 60 cases of children, less than one hour old, reported by Dr. L. Robinson,[2] all but two were able to sustain the whole weight of the body at least 10 sec., 12 of these for one-half minute, and 3 or 4 for nearly 1 min. At the age of four days nearly all could hold themselves suspended for half a minute. This power reached its maximum at two or three weeks of age, when several were able to hang suspended for 1.5 min., two for over 2 min., and one three weeks old for 2 min. 35 sec. One child held its weight for 5 sec., with the left hand alone after letting go with the right. This extraordinary strength is wholly purposeless in infants at the present time, and is all the more remarkable when we reflect that the child is otherwise at this age, and for long afterwards, a mere "sprawling ball of helplessness."

Even the reflex act of grasping an object which touches the palm can be of no value to the child now, except to point to a former period when life itself depended upon it. The child's employment of only its hands in the first stages of creeping, while the feet are dragged behind, points to a predominant hand-use in the trees. The child's tendency, mentioned by Holmes, James, and others, to pick up objects with its mouth when it is creeping and its hands are employed, is believed to be a relic of prehuman ancestry.

In no case during the foregoing experiments did the lower

[1] Huxley: *Anatomy of Vertebrated Animals*, 1881, p. 417.
[2] Nineteenth Century, Nov., 1891. *Darwinism in the Nursery.*

limbs of the infant hang down and take the attitude of the erect position, but were flexed almost at right angles to the body.

In the use of its hands the baby shows a kinship to tree-climbers. In grasping an object it does not put the thumb on the opposite side, but takes the object between the fingers and palm. Arboreal ancestors in going from bough to bough would strike the branches palm first from above downward, grasping with the fingers.[1] In the species of monkeys which live most exclusively in the trees—the Ateles in America, Colobus in Africa, and Hylobates in Asia—the thumb has atrophied from disuse, and the fingers have grown together, because the whole hand has been used merely as a grasping hook. The feet of sloths, the most arboreal animals in the world, are noticeably hook-like.[2] It is said that in children the power to extend the hand perfectly straight is frequently not acquired till the age of six or seven, as a result of thousands of years of bough-grasping.

The chimpanzee and the orang, when going on all fours, support themselves usually on the backs of their closed fingers, and rarely on the palms of their hands. They are in a transitional stage from quadrupeds to bipeds. Young children in the same way turn their toes under.

Evolution in man's hand has taken place in two ways: by increasing the mobility of the thumb and fingers and their power of independent and varied action, so necessary in delicate work; and by reducing the number and the strength of the muscles used in prolonged grasping. A special flexor muscle for the thumb has been split off from the fibres of the deep flexor that bends the terminal joints of the fingers; in most apes and in some men these two form a single muscle. Along with this appearance of a new muscle is the disappearance of another, the *palmaris longus*, which was an important aid in climbing, keeping the fingers together without independence of action.[3] In negroes neither of these changes is so fully carried out as in Caucasian races. The power of independent toe-movement in children, and the wide separation of the great toe from the others, are also evidences of Simian relationship, and point to a period when the feet were used more for picking up objects, and the hands for supporting the body. These characteristics were afterward lost because not needed in most civilized shoe-wearing races, where toes are

[1] Buckman: *Babies and Monkeys*. Nineteenth Century, Nov., 1894.
[2] Darwin: *Descent*. New York, 1878. p. 51.
[3] Baker: *Address* in Proc. Amer. Assoc. for Adv. of Sci., 1890, p. 351.

becoming rudimentary and are often found grown together. But many bare-footed peoples make skillful use of their toes. By the help of their very mobile toes Chinese boatmen are said to be able to pull an oar, Bengal artisans to weave, and the Carajas to steal fish-hooks.[1] Nubian horsemen hold the rein between their toes. Many lower races—Negroes, Malays, Polynesians, and American Indians—grasp the branches of trees with their toes when climbing, and Büchner says the natives of New Guinea are able to climb from branch to branch without the use of their hands.[2] New-born children of even the highest races can hold an object as firmly with the great toe as with the hand.[3] The bottom of a young child's foot, when the toes are bent downward, shows deep creases corresponding to the lines of the hand. The most marked of these is where the chief folding-in of the skin would take place when the toes were habitually clasped around an object such as a branch.[4] This cannot be explained as being of any use to the child, as it disappears when the foot begins to be used for locomotion and is scarcely visible in adults, even when the toes are flexed to the utmost.[5] Such a change from hand to foot is not found in other animals, whose phylogenetic history has not included the use of the foot as a prehensile organ.

An infant's foot is much flatter than an adult's. The arch of the instep, which is necessary to steadiness and ease of locomotion, is not yet attained. The negro, too, has such a foot, which further resembles the monkey's in being longer than the European's.

Infants' feet are very noticeably turned inward. This is even more marked in the embryo, but disappears soon after the child learns to walk. In the quadrumana the feet are similarly turned inward as a convenience in grasping branches.[6] Thus, what is normal in the fully developed lower species, is also normal in the embryonic stages of the higher, but would be abnormal if found in the mature form. Many pathological conditions instead of being freaks of nature, are simply cases of arrested development, representing structures or functions which are perfectly natural in a lower species.

Even in walking, the outside edges of the ape's feet are used,

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[1] Hurley: *Man's Place in Nature.* New York, 1883. p. 104.

[2] *Position of Man in Nature.* For authentic statements of the delicate manipulation of which the toes are capable through training, see Virchow's *Beitrage zur Kenntniss der Bewegungen des Menschen,* Würzburg, 1883.

[3] Haeckel: *op. cit.,* Vol. II, p. 170.

[4] Robinson: *The Meaning of a Baby's Foot-Print.* Nineteenth Century, May, 1892, p. 795.

[5] *Ibid.*

[6] Romanes: *Darwin and After Darwin.* 1892. Vol. I, pp. 77-8.

and bowleggedness is very apparent, as also in the child just beginning to walk. This position of the foot is inconvenient for locomotion, however advantageous for prehension, and has undergone gradual modification as man has attained the erect posture, the large toe losing its independent action and its grasping power, and the sole of the foot becoming horizontal, with an arched instep. Along with this, other correlative changes have been brought about—the vertebral column has acquired its double curvature, giving it more elasticity and preventing jar to the whole frame, and especially to the head; the thorax and pelvis have been modified in shape; and the calves have been greatly developed by the additional work thus required of them. Huxley, quoting from an old English account,[1] tells of a species of ape, the Pongo, that "differeth not from a man but in his legs, for they have no calfe. Hee goeth alwaies upon his legs, and carrieth his hands clasped in the nape of his necke when he goeth upon the ground [which is interesting, as probably helping to bring about the double spinal curvature]. They sleepe in the trees and build shelters from the raine." The thin legs and large arms of the Payaguas Indians are attributed to the fact that many generations of them have passed almost their whole lives in canoes, with no work and little movement for their legs. An almost total absence of calves is a characteristic of many primitive races, especially of African and Australian blacks,[2] and is adduced in evidence of their nearness to ape-like ancestry.

The upright position, relieving the hands from any part in locomotion and leaving them free for the use of tools, has no doubt in large measure been the means of giving man "dominion over every living thing that moveth upon the earth," and in a real sense his "heaven-erected face" has brought the possibility of a moral nature and the promise of ever-ascending ideals.

The erect posture has been brought about chiefly perhaps through curiosity. When the gorilla wishes to see more distinctly the approaching hunter he rises to the upright position.[3] Monkeys and rabbits also stand erect to look at distant objects. "How recent this change is [in man], how new the attitude still is to him, is seen from the simple fact that even yet he has not attained the power of retaining the erect position long. Most men sit down when they can, and so unnatural is the standing position, so unstable the equilibrium, that when slight-

[1] *Purchas his Pilgrimes*, 1625. Quoted also by Büchner in his *Man in the Past, Present and Future*. London, 1872.

[2] Wallace: *Australasia*. London, 1880, 2nd ed., p. 86. Hartman, *Anthropoid Apes*. New York, 1886. p. 102.

[3] Winwood Reade: *African Sketch Book*, Vol. I, p. 151.

ly sick or faint, man cannot stand at all."[1] A further evidence of the comparative recency of attaining the erect attitude is the fact that children must *learn* to walk, while animals are able to do this at once. Children, however, make the alternate movements of the legs, necessary for walking, long before such a movement is of any service. It is the bipedal balancing which must be learned with such difficulty. The arms of a child, too, make alternate movements when the palms are gently stimulated. That is to say, both arms and legs inherit, from a million years of such employment, the necessary movements for quadrupedal locomotion, but the additional adjustments required in the upright position have not yet become instinctive, in the few thousand years of practice.

The higher apes' dread of water and the loss of their ability to swim are no doubt the result of their life being exclusively arboreal.

The disposition of hair on the arms furnishes undeniable evidence of arboreal life. The rudimentary hair of the arm from wrist to elbow points upward, and from elbow to shoulder downward. This occurs only in man and in anthropoid apes and some American monkeys. Wallace has observed that the orang, sitting in trees, places its hands above its head with the elbows pointing downward, the hair then serving as a thatch to the rain. Livingstone relates of the gorilla this same habit of sitting "in pelting rain with his hands over his head." This acquired characteristic in man is no longer serviceable, but being in no way detrimental it is not eliminated by natural selection.

Another evidence of man's descent, furnished by embryology, is the lanugo or covering of somewhat long dark hair found on the fœtus about the sixth month. It extends over the whole body, except the soles and the palms—which are also bare in the quadrumana—but is usually lost before birth, serving therefore no present purpose. It is frequently quite different in color from the later permanent hairy covering. At this stage the human skeleton approaches most nearly to the Simian type. Idiots, who resemble the lower species of primates, mentally and physically, are often much more hairy than normal persons.[2] Many of the higher apes resemble man in the disposition of hair on their bodies. In most of the higher Old World apes the face is nearly or quite bare, while the hair on the back of the head is usually long. On the outer sides of the limbs it is much more abundant than on the inner, which is paralleled by the fact that not unfrequently, according to Haeckel, men of

[1] Drummond: *loc. cit.*, p. 194.
[2] Darwin: *Descent*, p. 601.

Semitic race have the shoulders, back, and outer sides of the limbs abundantly covered with hair. African races also are disposed to be hairy.[1]

The flat noses of babies, with the breadth across the nostrils equal to the length of the nose, and the pouch-like cheeks, which are retained later, though not required in the human species for storing away food, as when hands were required for climbing, have been regarded as vestiges of lower types of animal.[2]

Savage peoples ought to show, both in physical structure and mental endowment, a closer correlation with man's nearest allies than is found in civilized races. Some instances of this have already been given: as in the relative length of arms and legs, the greater strength of the arms, the absence of calves. Along this line of evidence there are other facts to be adduced, anatomical, physiological and psychological.

The spinal curvature is increasing. In the Simian the lumbar curvature is backward, in the European it is forward. Even in negroes the collective measurement of the posterior faces of the five lumbars is greater than the anterior (106 to 100); in the white, the anterior faces exceed the posterior (100 to 96).[3] The humeral torsion is also increasing. In the stone age it was 152°; in the modern European it is 164.° The humerus was formerly set so that the hollow of the elbow looked inward rather than forward; and as the functions of the arm became more various the lower end of the bone twisted outward around the long axis. By this means the palm of the hand was turned to the front and adapted to a wider usefulness. Not only does this torsion become greater as civilization advances, but there is a difference even between the right and left arm,[4] as a result of generations of righthandedness. As a further result of the increased use of the hands, the scapula has widened to give a more extended attachment for the muscles used in movements of hand and arm. The scapular index (ratio of breadth to length) is highest among white races, less in infants, negroes, and Australians, and still less in anthropoid apes.[5]

The great toe of the Annamese, which projects at a wide angle from the foot, is mentioned contemptuously by the Chinese 2285 B. C., the race being called the "cross-toes." The atrophy of the little toe is evident by comparing shoe-wearing races with the bare-footed and with children, whose toes run much

[1] Johnston: *The River Congo*, 3rd ed., 1884, p. 414.
[2] Buckman: *loc. cit.*
[3] Osborn: *Present Problems in Evol. and Hered.* Smithsonian Report, 1892, p. 313.
[4] Baker: *loc. cit.*
[5] Baker: *ibid.*

more squarely across. Pfitzner[1] finds that the little toe is losing a phalanx, the two end-joints in the skeleton being fused in 41.5% of women and 31% of men. The progressive divergence of the form of the female pelvis from the male in higher races, is shown by the fact that it becomes increasingly difficult in lower races to distinguish the female skeleton from the male. The relatively large female pelvis would for perfectly obvious reasons be preserved by natural selection.

II.

Psychic Reverberations.

When we pass from the physiological to the mental the evidence cannot be so definite. At best it cannot amount to certainty, but only to probability. There are no psychic rudimentary organs to be studied on the dissecting table, and no fossil remains of mind embedded in the rocks of the Miocene and Pliocene periods. There are products, to be sure, of mental activity to be found in the earliest implements of the rude stone age, but the inference from material products to mental processes is vague and uncertain. Savages are scarcely to be found who are still in the palæolithic age, and even if they were, that would be an enormous advance on the intellectual existence accompanying tree-life. Farther back than these material witnesses to man's advancement, and the evidence furnished by present primitive races, we cannot go. Doubtless a previous age of wooden implements and instruments existed, the beginning of which is shown by the apes who use a club or a branch of a tree as a weapon, but the lack of durability in such material has left us no evidence; and man himself, for ages after emerging from such a condition, could leave no record in chronicle or tradition.

Furthermore, though the child may recapitulate in some degree the mental evolution of the race, the interpretation of the child's mental states is extremely difficult and unsatisfactory. We cannot project ourselves into the child's consciousness. We can only interpret the manifestations of his mental life by employing the adult mind as a standard, and our conclusions are more and more untrustworthy according as the intelligence to be studied is farther removed from the standard of measurement. There is even a further chance of error: our standard—the mature mind—is itself an abstraction, reached by inference, using our individual mind as the primary standard. We *must* judge others by ourselves; there is no other way open.

But in spite of the disadvantages of the method, and the con-

[1] *Nature*, Vol. XLII, p. 301.

sequent uncertainty of the results, some conclusions of reasonable validity can perhaps be reached. In the customs of savage tribes, in the traditions of barbarous peoples, in the myths of civilized nations, there are survivals from a dateless age, which give us glimpses of the intellectual condition of man, while as yet he was only emerging from brutehood.

Leaving aside the folk-lore and the social and religious institutions of man, the present section attempts to point out certain vestigial remains in the mind, and ventures to suggest, as the most probable explanation, a long-since deserted home in the trees. "Do we not," says Dr. Hall, "dishonor the soul by thinking it less complex or less freighted with mementos of its earlier stages of development than the body?"[1]

Structures and functions change in compliance with a changed environment, or accidental variations arise and find themselves more in harmony with the surroundings. These, therefore, persist and widen; appearing in individuals, they soon become the characteristic of varieties, species or genera. Thus what was at first merely a chance variation, or a modification through environment, by either an intelligent or an unconscious adjustment of the organism, becomes stable in the race by transmission, that is, becomes an instinct. As we progress up the animal scale more instincts are called into being, as the environment becomes more complex—the growing complexity demanding new adaptations. Among higher species conscious adjustment probably plays a much larger part in the origin of particular instincts, and blind natural selection a smaller part.

The decay of instinct, on such a theory, would of course be brought about by a change of surroundings which would call for a modification of some of the life-habits of the species, and the reverse process would be by the same means in general—not necessarily in each instance—as were employed in originating and perfecting the instinct; namely, natural selection and conscious or unconscious adjustment. If in the new circumstances any given instinct were harmful to the well-being of the race, the non-survival of the unfit would soon result, unless a change in the organism could be effected which would bring it into harmony with the new conditions. An obvious exception to this, of course, would be the case in which a structure, whose function had become useless or detrimental, was enabled to maintain or regain its place of honor among the other members of the organism by exchanging its old functions for a new and useful one. But provided the old instinct under the new

[1] *A Study of Fears:* AMERICAN JOURNAL OF PSYCHOLOGY, Vol. VIII, p. 147.

conditions were merely useless, not harmful, and wasted none of the energy of the body which would have been available for other purposes, it would not then be eliminated by natural selection, and might remain for thousands of generations before becoming completely atrophied. So long as vestiges of it remained, we might hope to awaken them into activity by reinducing the conditions under which the instinct was formerly active. This is scarcely open to direct experiment, but nature in some degree reproduces for us these conditions in the organism, though very rarely in the environment. Such opportunity for observation is given us in children, savages, pathological cases, and in normal adults under conditions in which the higher faculties are not exercising due control, as in sleep. There are cases, even, as in unreasoning and entirely baseless fears, where the exercise of our strongest will is unable to cope with the strength of the instinct.

In the child the higher centers are not yet called into activity. Mentally he is the equal at about fifteen months of the mature ape,[1] and might be expected to show some of its characteristics, and the more so as the environment tended to call forth such reflexes, and the child's strength were equal to the task of responding. The same would be true of savages, without the limiting condition of physical strength, if any could be found so low intellectually as to approach the apes. In certain pathological cases a similar result is reached by an opposite process. Instead of the brain and the mind being built up only to a certain level — using "level" somewhat figuratively, since the intellectually higher and lower in function correspond only roughly to the literally higher and lower in structure — the higher centers have been broken down until the given level is reached. This destructive process follows the law of regression — the reverse of the constructive process. The last to be acquired is the first to be lost. The higher the development the greater is the danger of reversion, as complex products are more unstable than simple ones. Now, instincts which have been active for many generations have become deeply rooted in the very constitution of mind, and although they may have fallen into disuse, or been overgrown and buried so deeply that their very presence is unsuspected, yet when disease has swept away the higher levels, and attacks these, they once more regain their functioning and assert their power, and we get a condition of things similar to that of organisms which have only reached this point in their upward journey. Many idiots are cases of arrested development; senile dementia and diseases which affect the brain present instances of the breaking-down

[1] See Romanes' chart in his volumes on Mental Evolution.

process. A good illustration of this law of reversion is found in people who emigrate to a foreign land in childhood or early youth, and use the language of the new country the rest of their lives, to the utter forgetfulness of their native tongue, but who revert to their earliest speech on their deathbeds. In patients who have been for years insane, a fever will sometimes restore sanity, and during this restoration there will be a perfect memory of things happening before insanity came.[1] That is, the later-formed strata, the deranged centers, are broken down by the attack, and the earlier normal formations are reached, whose functioning brings a restoration to former conditions. We have only to carry the process a little farther down to reach brain levels which represent ancestral modifications. The possibility of such centers being present but inactive is seen from the fact that certain normal instincts do not come into action till maturity. Along with them often appear other mental characteristics which are directly hereditary. At puberty, for instance, peculiarities of thought or feeling directly traceable to forefathers, are frequently developed. Finally, in dreams the will is dormant, the highest centers are, as a rule, inactive, but the lowest brain levels, with the spinal cord and the nerves, only slightly relax their functions, and many reflex acts, therefore, take place. The parts of the brain which distinguish man from the lower animals are much more likely to be inactive during sleep. In sleep, therefore, the tendency is stronger to show atavistic characteristics, both in our attitudes and in our dreams. The visceral and other functions intrude on thought in our waking hours, but their presence on the threshold is, for the most part, disregarded, because our mental reception room is too constantly crowded with guests of a higher caste; but when these have all retired, and consciousness seeks rest, the less honored visitors enter unbidden.

The remainder of the chapter will be devoted to giving examples illustrative of these principles.

Of certain instincts and emotions, then, which serve no present purpose, we must seek an explanation far back when conditions of life differed widely from those of to-day, and when the struggle for existence involved fewer of the elements of higher civilization. An instinctive fear of wild animals, or what has less present justification, the fear of reptiles, may well have arisen, through natural selection, at a time when safety, and even life, depended on flight. Monkeys are known to have a great horror of snakes. The serpent, better than almost any other enemy, can follow an animal up a tree, and attack its

[1] Forbes Winslow: *Obscure Diseases of the Brain and Disorders of the Mind.* 4th ed., 1868, p. 59.

young. From some such enmity and struggle for life, lasting many generations, must have arisen our unfounded fears of the snake.

The percentage of these fears of reptiles, though standing second in Dr. Hall's classified list, is yet exceeded by the fear of thunder and lightning, the frequency of which is out of all proportion to the actual danger. We must therefore seek elsewhere than in present conditions for the rise of this fear; and may it not be that it dates back to tree-dwellers, who would be much more exposed to such a danger? Lightning, as is well known, is much more liable to strike a tree, than an open plain, on account of the former being a better electrical conductor than the air, and having a tipped summit. This danger would still persist through the extended period of man's descent from the trees, and as long as the species had the habit of huddling together beneath the branches as a protection from the storm. It is said that children and savages fear the thunder rather than the lightning, but this of course in no degree affects the argument, inasmuch as it is the thunder which is believed by the primitive mind to be the destroying force.

The fear of high winds which is very common even in districts never visited by tornadoes, may also be explained by the added danger, to tree-natives, of such winds as uproot or dismember the trees. This continuous open-air life would be much subject to other atmospheric influences, and the psychic effects of the weather would be very marked. The constant change of temperature and variations of moisture would be all-important factors in man's physical well-being, and would leave a lasting impress on the constitution of his mind. Is this why the weather has come to be the never-neglected topic of conversation among all races?

The fear of falling is instinctive, as it is found in children who have had no individual experience to justify it. If an infant be dandled up and down on the arms, it will be at rest while being raised, but when descending its struggles will show a sense of danger. Such fears of falling (barophobia), as well as the child's "monkey-like propensity to climb everything, everywhere," may be reverberations from different stages of a life in which climbing and falling were daily experiences.

The fear of strangers, instinctive in children at a certain age, has no reason in the present nature of things, as the children have received only kindness from every one. Such a fear must therefore have survived from the time when it brought safety,[1] when every man's hand was against his

[1] Robinson: *Darwinism in the Nursery.*

neighbor. To the same origin is attributed the game of hide-and-seek, so common, so instinctive one might say, among children, they take to it with such readiness without teaching, when only just able to walk. Hiding behind a chair or curtain, and pretending to be greatly alarmed when discovered, is only making play out of the formerly serious business of life, the furniture of the nursery being substituted for the trunk of a tree behind which the body would be hidden, the eyes protruding for a momentary glance at the enemy, and then quickly withdrawn again.[1] The instinctive holding of the breath when the seeker comes near may have been purposive, the breath otherwise being sufficient to betray the hider's position. The play of animals is very often mimic war, and the games of children are not unfrequently mere relics of religious ceremonies, social customs, or habits of life, whose significance has long since departed.

Fear in the woods is not entirely accounted for by the possibility of present danger, for even adults have traces of such timidity when they know there is absolutely no danger near. Schneider suggests that this is a relic of the period of savagery when darkness and forests were inseparably associated with danger. Darwin had already attributed his child's fear of large animals to the hereditary effects of the real danger of savage life. Agoraphobia, too, probably had its origin when safety depended upon keeping hidden, and running across open spaces was an exposure to be avoided.

The sleep of children shows physiological tendencies which suggest certain ancestral modes of life. Young children when left to themselves will naturally go to sleep on their stomachs, with their limbs curled under them, or often using one arm as a pillow, which is exactly the position adopted by orangs and chimpanzees. West Indian mothers and nurses lay children down in this way. Some savage tribes sleep with the head bent down upon the knees, just as monkeys do.[2]

Putting babies to sleep by rocking is probably taking advantage of a rhythm which has become ingrained through long ages of swaying in the branches of trees, which would be the natural accompaniment of sleep, with creatures of arboreal habits.[3] Rhythmic movements of even short duration leave their imprint on the organism. Sailors after long voyages are unable to sleep well on land, having become accustomed to the rocking of the vessel. Even a landsman, after a voyage of only a few hours will have for some time afterward a feeling of

[1] *Ibid.*
[2] Robinson: *19th Cent.*, Nov., 1891.
[3] Buckman: *loc. cit.*

swaying to and fro when sitting or lying down. The rhythm of walking is often kept up by soldiers on the march when asleep, and therefore entirely without conscious supervision. Plants as well as animals are susceptible to impressions from rhythmic influences. Francis Darwin and Miss Pertz have shown that a plant will continue a rhythmic movement which it has been compelled to obey for a short time, and will curve against gravity though itself a geotropic plant. Heliotropic plants curved away from the sunlight for two half-hourly intervals, separated by one of curvature toward the light, so strongly in a short time had the artificially-induced rhythm been impressed upon them. We may therefore fairly conclude that children, or even adults, will still show traces of rhythms which played upon the organism for perhaps thousands of generations. Evidence is furnished by the regular swaying back and forth of children when standing long, and the similar movements of imbeciles, in both of whom the higher centers are not active for the inhibition of such useless movements.

May it not be that even adult methods of inducing sleep are effective because of this racially-ingrained connection between rhythmic movement and the fading of consciousness—such methods, for example, as counting, watching the long line of imaginary sheep skip over the bars single file, listening to falling drops of water, or imagining one's self rocking on the bosom of a lake? One might even go farther and say that the somnolent effect of all monotony of either thought or feeling is, if not induced, at least strengthened, by thousands of years of swaying in the trees. It has been suggested that the most common of all our nursery ditties, the

> Rock-a-bye baby in the tree top, etc.,

and the somewhat similar German

> Schlafe, schlaf ein, mein Kind!
> Horch! da draussen der Wind,
> Wie das Vöglein im grünen Baum
> Wiegt er auch dich in Süssem Traum

—that these bear evidence of some lingering traditions of a race of tree-dwellers.

The Lithuanian boy Joseph, who was found among the bears and had animal desires and appetites fully developed, in going to sleep always squatted in a ball and rocked himself.

Darwin gives cases of hereditary habits shown in sleep. Quoting from Galton he tells of a gentleman who had the trick of raising his right arm slowly in front of his face and then dropping it with a jerk across the bridge of his nose. This happened only when he was sleeping soundly. His son had the same habit, and passed it on to a daughter of the third

generation. Ribot speaks of a man who was in the habit of going to sleep with the right leg crossed over the left, and one of his daughters constantly assumed that posture in the cradle. In this way ancestral experiences may bring about certain tendencies in the nervous constitution, which will be manifested, though entirely useless, whenever the conditions are reinstated which originally gave rise to such movements.

The climbing instinct of boys—which indeed is shown by girls too at the age when they are not troubled by oversensitiveness—has been regarded by Darwin as a relic of former habit. The baby shows this also in a remarkable degree in his "insane desire to climb up-stairs." The purposeless spontaneous movements of infants are probably rudimentary traces of functions which were once of importance.[1] The restlessness of children, which gives them so much pleasure in mere movement, may also be an inheritance from the days when it was impossible to be still.[2]

Suggestibility, which shows little conscious control, and is therefore indicative of a low degree of mentality, is remarkably strong in monkeys and children, in lowest primitive man, congenital idiots and hysterical subjects. In a child of six months there is no such thing as mental inhibition present. The beginnings of it appear at one year of age. But during all the earlier years the inhibitory centers are not fully developed, hence the tendency to imitation is very persistent. In certain diseases this imitation gets to be a mania; in latah the patient repeats everything said and done in his presence, and while knowing the absurdity, or even the immodesty, of his actions, is entirely unable to inhibit the movements.[3] The imitativeness of the monkey is equalled by some of the lowest savages. Among the Lapps Hugstrem found individuals who imitated every movement of those who talked to them, as well as the expression of the face.[4] The medicine-men and sorcerers among primitive people assume many ape-like attitudes, in the mental excitement of their contortions and dances. Relieved from the inhibitions normally imposed by the intellectual operations accompanying the functioning of higher brain centers, the lower centers, representing more racial and earlier-acquired instincts, have fuller sway, and the actions illustrate reversions to earlier types.

The stories told of children who have been lost or have wandered away into the woods, and have lived there for years in

[1] Mumford: *Survival Movements of Human Infancy*, Brain, Autumn, 1897.
[2] Buckman: *loc. cit.*
[3] Marie de Manacéïne: *Sleep*, p. 120.
[4] Manacéïne: *op. cit.*, p. 119.

companionship with animals, are for the most part unreliable, but when well sifted still leave an authentic residuum. Such persons show reversions to types much farther back than primitive man. They are expert climbers, usually run on all fours, and can only be taught, after much effort, to assume the upright position. They lap water with the tongue, and have a remarkably developed sense of smell, but are entirely destitute of feelings of modesty.[1]

In idiots the higher volitional functions are absent, and their restraining hand—which is heavy upon all of us, but unfelt because of its continual presence—is lifted from these unfortunates, and they often show by action and expression a forcible likeness to apes. The most hopeless cases, which have much less intelligence than apes, show such atavistic characteristics as the vacant stare, gluttonous appetite, thick everted lips, ill-formed large ears, fingers long and slender.[2] Attention, judgment, foresight, will, are entirely wanting. Those, however, which show a less degree of idiocy are usually active, alert, mischievous, imitative, intractable. When no effort is made to educate them, their muscular activity, in the necessity of finding an outlet, often makes them little demons.[3] Sollier tells of a boy of ten who has never walked normally, but who climbs into trees.[4] Clouston describes a girl who has from childhood beaten her head with her hands as the gorillas beat their breast. She kneels down and laps water with her tongue. Her face is beast-like in its appearance, and she lacks even a rudimentary sense of decency.[5] Krause speaks of the ape-like boy, observed by him, as being very supple and fond of climbing, and having great strength in his hands and arms. His hands had a horny appearance, like those of a chimpanzee. His walk was unsteady, the great toes of both feet being at an angle to the foot. He often stamped his feet and clapped his hands, making a grunting noise like a gorilla. His imitative tendency was especially marked, and all his movements strongly resembled those of apes.[6] Hartman also observed a semi-idiotic boy, whose shuffling gait, gurgling voice unable to utter words, and habit of striking with his closed fingers on

[1] See Ireland, *On Idiocy and Insanity*, London, 1877; Rauber, *Homo sapiens ferus*, Leipzig, 1888; von der Linde, *Kaspar Hauser*, Wiesbaden, 1887; Tylor, *Wild Men and Beast-Children*, Anthropological Review, 1863, p. 21, etc.

[2] Bucknill and Tuke: *Manual of Psych. Med.* London, 1879.

[3] Clouston: *Mental Diseases.* London, 2nd ed., p. 285.

[4] *Psychologie de l'Idiot et de l'Imbécile.* Paris, 1891. p. 89.

[5] Clouston: *op. cit.*, p. 283.

[6] *Correspondenzblatt der deutschen Anthropologischen Gesellschaft*, 1878, p. 133. Quoted by Hartman.

the ground, gave him a marked resemblance to apes.[1] In other cases, of course, such resemblances are very slight, although microcephalous idiots are, as a rule, strong and active, continually gamboling, and fond of climbing up furniture and stairways.

The male criminal type, which represents the normal in a primitive age, constantly reproduces the psychic characteristics of savages—want of foresight, inaptitude for sustained labor, and love of orgy. Like the lower human races, too, the criminal presents far more abnormalities of anatomy than the average European.[2] In woman the natural form of retrogression is not crime, but impurity, and in the professionally unchaste the moral reversion is accompanied by physical and mental degeneration. Their use of hieroglyphics in writing and their fondness for tattooing show atavistic qualities. Their cranial capacity is much below the average, and the great majority of them[3] show signs of physical degeneration, in asymmetry of face, anomalies of teeth or ears, or in the enormous lower jaws found in three times as large a proportion of them as of normal women. They have also longer hands and arms, and often a prehensile foot.[4]

III.

Tree-Worship.

Passing from the present evidences, in man's body and in his soul, of earlier conditions of existence which have profoundly modified these, let us look at the testimony of the beliefs and customs of mankind. We now pass, then, from individual to social psychology. And first to gain an idea of the widespread belief in tree-spirits, as extended perhaps in space and time as the human race itself. The mythology of the ancients and the folk-lore of the moderns abound in evidence. "Of all primitive customs and beliefs there is none which has a greater claim upon our interest than the worship of the tree, for there is none which has a wider distribution throughout the world, or has left a deeper impress on the traditions and observances of mankind."[5] The earliest nations of history, the Chaldæans, Persians, Egyptians, Chinese, worshipped trees. The semi-civilized peoples of to-day offer sacrifices and gifts to the tree-spirits. Among the Dyaks of Borneo certain trees must not

[1] Hartman: *Anthropoid Apes*, p. 202.
[2] Ellis: *The Criminal*. New York, 1890. p. 208.
[3] 84% according to Madame Tarnowskaia.
[4] See Lombroso and Ferrero: *The Female Offender*. New York, 1895.
[5] Mrs. J. H. Philpot: *The Sacred Tree*. London, 1897. p. 4.

be cut down, or their spirits would avenge themselves on the natives. The Talein of Burmah offer prayers to the inhabiting spirit before felling the tree. The Siamese offer cakes and rice to the takhien-tree when they want to use it for boat-building, and believe that the nymph passes as guardian-spirit into the boat built of the wood. The Ojibwas hear the trees utter their complaint when needlessly cut down. Greek and Roman mythology abounds in dryads whose lives are so connected with that of the tree that they are hurt when it is wounded and die when it falls. The May-day festivals of modern Europe are relics of religious rites originating in tree-worship. The World-tree in Norse legend and in Hindoo mythology, the sacred tree of Buddha, the Paradise trees of the Hebrews, the Persians, the Arabians, the trees from which the human race was born, and into which it passes, all attest the influence which this form of the life of nature has had upon the life of man.

It will be necessary to give in somewhat more detail some of the beliefs and customs regarding tree-gods and tree-demons. The primitive mind is unable to make abstractions to any great extent, or to think of ideal invisible things. Hence, in the earliest conceptions, trees were spirits, and the form of the spirit was that of the tree alone. This is a state of animism and not polytheism. Later when there comes a clearer distinction between spirit and matter, the tree is only the habitation of a spirit which has a more or less human shape, and the symbolic representation of such spirits employs a dress of leaves or flowers or a branch carried in the hand.

The Wanika in Eastern Africa think that every tree, especially the cocoanut, has a spirit, and because it gives life and nourishment, its destruction would be matricide.[1] The Siamese Buddhist monks think that to break a branch of a tree is like breaking a person's arm, and cutting down a tree is dispossessing a soul. In some parts of Austria peasants will not allow even the bark of a tree to be cut, and in felling a tree they always beg its pardon. Some Asiatic peoples offer gifts to a tree before felling it, to appease the spirit, who might otherwise avenge himself for being thus left without a dwelling. In Sumatra, as soon as a tree is felled, a sprout is planted on the stump as a new home for the spirit, and coins are placed on it as a compensation for the disturbance.[2] The wails of the trees when cut down have been heard even in England not many years back. The sacred grove of Samoa, in which no tree was allowed to be cut, is mentioned by many travellers, and the story is told by the natives of some un-

[1] Fraser: *Golden Bough*. London, 1894. Vol. I, p. 59.
[2] *Op. cit.*, p. 63.

believing strangers who attempted it, but soon fell ill and died, after seeing blood flow from the wounded tree. That trees were believed to be not simply the dwelling places of spirits but their bodies, is further shown by such accounts as Ovid's of the "sap gushing crimson-red from the wounded bark" of an ancient oak.[1] In Livonia is a sacred grove in which if any one fells a tree it is believed he will die within a year. The life of the Greek dryads depended upon the life of the tree which they inhabited, though they had the power of leaving their abode and wandering at will as beautiful maidens. Similar to this is the legend of Alexander and the flower maidens. In a certain wood enormous flowers grew out of the ground, from each of which leaped forth a beautiful maiden whose singing rivalled the birds and brought forgetfulness of all sorrow. But when the flowers faded in the autumn the life of happiness which Alexander and his Knights had lived in companionship with these creatures of loveliness came to a sorrowful ending.[2]

The Satyrs of the Greeks and the fauns of the Romans were deities of vegetation to whom offerings of fruit and grain were made, to gain their good-will and thereby abundant harvest. In Saxony elder branches may not be cut until permission has been asked of the hylde-moer (elder-mother) who dwells therein, the formula repeated three times on bended knee, being "Lady Elder, give me some of thy wood; then will I give thee also some of mine when it grows in the forest."[3] Fairies, elves, and pixies are usually of kindly character, but must not be lightly offended. They are still believed in by many of the peasantry of even Germany and England. The oak is their favorite resort, but in Scandinavia the black dwarfs hold their revels under the elder tree.[4] A species of Teutonic wood-sprite called the *schrat* were objects of special worship in the earlier centuries of the present era, and had trees and temples dedicated to them, though they were usually wild and shaggy in appearance and elfish in character.[5]

Though there are many wood-spirits of evil or questionable character, yet considering the sacredness of trees in general and the forest-worship of many peoples, the beneficent and god-like character of tree-spirits is far more predominant than the satanic. Evil spirits, however, as well as good, still inhabit the

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[1] See Mannhardt: *Baumkultus.* Berlin, 1875. pp. 34, *et seq.*

[2] Mannhardt: *Antike Wald-und Feldkulte.* Berlin, 1877. pp. 1-2.

[3] Folkard: *Plant Lore, Legends and Lyrics.* 2nd ed., London, 1892, pp. 80-81.

[4] Folkard: *loc. cit.*, p. 67.

[5] Grimm: *Teutonic Mythology.* tr. by Stallybrass. London, 1882-1888. p. 481.

forests of Europe. The Lyeshy of the Russian peasants somewhat resembles the mediæval pictures of the devil, with horns, hoofs, claws and shaggy hair. The similarity extends to the character also, for the Lyeshy constantly causes travellers to lose their way, by altering landmarks or assuming the likeness of some tree which has formerly been used as a guide. Sometimes the spirit takes the form of a traveller and engages the passer in conversation so absorbing that he forgets his course and soon finds himself in a swamp or ravine, the loud laugh of the demon telling him that he has been duped.[1] The success of the sportsman depends on the good-will of the Lyeshy, so to please this spirit a piece of bread, or a pancake sprinkled with salt, is laid on the stump of a tree as an offering. The hunters of some districts present him with the first animal bagged, leaving it in an oak forest. The Perm peasants offer up prayers to him once a year, presenting him with tobacco, of which he is fond. If any one falls ill after returning from the forest his friends say, "He has crossed the Lyeshy's path." A cure is effected by carrying bread and salt to the forest, and uttering a prayer over the offering.

These evil spirits quarrel among themselves, using huge trees and massive rocks as weapons. Hurricanes are really their combats, and the creaking of branches their voices. The echoes of the wood are their calls to allure unwary travellers to dangerous ground.[2]

The iron-wood tree of Tahiti is regarded as the embodiment of an evil spirit, perhaps because it has furnished material for all the weapons of warfare in the past history of the people. Connected with the origin of this tree in the island there are legends of a powerful but malignant spirit.[3] The Pàdams of Assam think that when a child is lost it has been stolen by the tree-spirits, and as a retaliation they cut down trees until they find it. The spirits, fearing that they may be left without a tree in which to live, give up the child, and it is supposed to be found in the fork of a tree.[4] In Hadramant it is dangerous to touch the sensitive mimosa, lest the spirit of the plant avenge the injury.[5] When Omayya and Abi 'Amir, who lived a generation before Mohammed, set fire to a tangled thicket with the purpose of bringing it under cultivation the jinni of the place, in the shape of white serpents, flew off with cries of woe, but

[1] Ralston: *Songs of the Russian People.* London, 1872, 2nd ed., pp. 157–8.
[2] Ralston: *op. cit.*, pp. 153 *et seq.*
[3] See Gill: *Myths and Songs from the South Pacific*, pp. 82–5.
[4] Fraser: *Golden Bough*, quoting Dalton's *Ethnology of Bengal.*
[5] Robertson Smith: *Religion of the Semites.* New York, 1889. p. 125.

soon avenged themselves by the death of the intruders.[1] The moss-woman of Central Germany, "loosely clad from neck to foot in a mantle of moss from the maple's root," is another of the unfriendly spirits that are a terror to the peasants, though they may sometimes help industriously in the harvest field.[2] A Bengal folk-tale tells of a banyan tree haunted by ghosts who wrung the necks of all who were rash enough to approach during the night.[3] The Burman hunter deposits some rice and ties together a few leaves whenever he comes across a tree of imposing appearance, lest there should be a Nat or wood-spirit dwelling there.[4] Among the Bongos of Africa malignant spirits are believed to inhabit gloomy forests, and all old people, especially women, are suspected of having relations with these and of consulting them when they wish to injure their neighbors. With the Niam-Niams, also, the forest is a shelter for evil spirits who are constantly conspiring against man. The rustling of the leaves is the mysterious conversation of these ghostly inhabitants.[5]

The sacred groves of the middle ages and the holy trees which are still worshipped are direct survivals of the tree-spirits of earlier times. It is literally true that "the groves were God's first temples." "Temple means also *wood*. What we figure to ourselves as a built and walled house, resolves itself, the farther back we go, into a holy place, untouched by human hand, embowered and shut in by self-grown trees. There dwells the deity, veiling his form in rustling foliage of the boughs. . . . Here and there a god may haunt a mountain-top, a cave of the rock, a river; but the grand general worship of the people has its seat in the grove."[6] After the introduction of Christianity among Germanic tribes, as a compromise to heathen customs the places of worship were still in the groves, and only very gradually did the worship of trees give place to a less materialistic form. For some time after conversion the people continued to light candles and offer sacrifices under particular trees. Down to the present, wreaths are hung upon them, and religious dances held under them.[7] In the principality of Minden on Easter Sunday the young people used to dance around an old oak with loud shouts of joy, and near Wormeln still stands a holy oak which the inhab-

[1] Robertson Smith: *loc. cit.*, p. 125.
[2] Philpot: *loc. cit.*, p. 67. Mannhardt: *Baumkultus*, pp. 74–86.
[3] Folkard: *loc. cit.*, p. 79.
[4] *Ibid.*
[5] *Ibid.*, p. 80.
[6] Grimm: *op. cit.*, p. 69.
[7] Grimm: *op. cit.*, p. 649

itants of the village visit in solemn procession every year.[1] To the ancient Prussians, Romove with its holy oak, hung with cloths and images, was the most sacred spot in the land. No unhallowed foot could be set in the forest, no tree felled, not a bough injured, nor a beast slain.[2] In some of the sacred groves, far as the shade extends not a strawberrry is picked.[3] At Upsala, the old religious capital of Sweden, there was a sacred grove in which every tree was regarded as divine. The common people believe that breaking a bough from an ash is very dangerous,[4] the ash being, next to the oak, the most sacred of all trees among Teutonic nations. The oak was sacred to the Druid god Buanawr. The mistletoe, "the tree of pure gold," as it was called,[5] growing on the oak, was gathered with great pomp and solemnity. After due preparation the tree was hailed as the universal healer, and beneath it were brought two white bulls whose horns had never been bound; a priest in a white robe cut the mistletoe with a golden sickle, the falling branches being caught in a white cloth. Everywhere among the Semites, too, the tree was adored as divine,[6] and one of their modern representatives, the Arab, believes certain trees to be sacred, and accordingly honors them with sacrifices and decorations. They are called *manāhil*, places where angels or jinni descend with dancing and song. From these trees not a bough must ever be plucked.[7] In earlier times the sacred date-palm was worshipped at an annual feast, and hung with fine clothes and women's ornaments. To the sacred acacia the people of Mecca resorted, decorating it with weapons, garments, ostrich eggs and other gifts. By the Phœnicians plants were esteemed as gods, and honored with libations and sacrifices.[8] Among the Canaanites every altar had its sacred tree, and in the early Hebrew worship the *ashera*, a planted tree, was a symbol of deity. Even in later times, when the planting of the *ashera* beside the altar was forbidden,[9] as being associated with heathen customs, the sanctuary was beautified by "the glory of Lebanon" and other evergreens.[10] The cedar has always been regarded by the Jews as sacred, and even to-day the Greeks and Armenians go up to

[1] *Ibid.*, pp. 73-4.
[2] Grimm: *loc. cit.*, p. 77.
[3] *Ibid.*, p. 648. Foot-note.
[4] *Ibid.*, p. 651.
[5] Davies: *Mythology of the British Druids*, 1809, p. 280.
[6] See Sayce: *Religion of the Ancient Babylonians.*
[7] Robertson Smith: p. 169.
[8] Robertson Smith: *op. cit.*, p. 169.
[9] Deut. 16:21.
[10] Isa. 60:13. See also Jer. 3:13. Other tree personifications are found in Judg. 9:8-15; II Kin. 14:9, etc.

the cedars of Lebanon and celebrate mass beneath them, at the feast of the Transfiguration.[1] In the Roman church the number of trees and plants dedicated to the Virgin Mary, the Saviour, and the saints, is too large a list to be enumerated, while at each festival the church is adorned with particular branches and flowers whose symbolism is supposed to be especially appropriate—as the edelweiss, the emblem of immortality, for Ascension Day; the trefoil for Trinity Sunday. The holly or "holy tree" as a Christmas decoration is wide-spread.

Tree-worship is deeply rooted in Malay cosmogony, and on giant trees, or such as have become twined together, a shrine of some kind is always to be found, with offerings to the spirit.[2] Guatama Buddha is represented as having been a tree-spirit forty-three times in his previous incarnations, and it was under the peepul or bo-tree that he achieved perfect knowledge. It thereby became specially sacred, and its leaves, or its successors', are still gathered and treasured by pilgrims. "The history of the transference of a branch of the bo-tree from Buddhgayâ to Anurâdhapura is as authentic and as important as any event recorded in the Ceylonese annals. Sent by Asoka (250 B. C.), it was received with the utmost reverence by Devanampiyatisso, and planted in a most conspicuous spot in the center of his capital. There it has been reverenced as the chief and most important 'numen' of Ceylon for more than 2,000 years; and it, or its lineal descendant, sprung at least from the old root, is there worshipped at this hour. The city is in ruins; its great dagobas have fallen to decay; its monasteries have disappeared, but the great bo-tree still flourishes according to the legend 'evergreen, never growing or decreasing, but living on forever for the delight and worship of mankind.' Annually thousands repair to the sacred precincts within which it stands, to do it honor, and to offer up those prayers for health and prosperity, which they believe are more likely to be answered if uttered in its presence. There is probably no older idol in the world, certainly none more venerated."[3]

The sacred tree of Kum-Bum is not permitted to be touched. The bark and leaves are said to contain letters of the Thibetan alphabet.[4] The Bygas of Central India carefully preserve certain trees and present them offerings of food, clothes or flowers. They will often turn aside before some tree, and

[1] Folkard: *op. cit.*, p. 23.
[2] Ratzel: *History of Mankind.* Tr. by Butler, London, 1896, Vol. I, p. 471.
[3] Fergusson: *Tree and Serpent Worship*, 2nd ed., 1873, p. 59.
[4] *Nature*, March 5, 1896, p. 412.

bowing reverently implore the protection of the spirit, and offer up, if nothing else is at hand, a torn fragment of the already scanty garment.[1] The Zend-Avesta ordained that the trees which the god Ormuzd had given should be prayed to, as pure and holy; and when Zoroaster died his soul was translated into a lofty tree on a high mountain.[2] All the uneducated classes in Japan believe trees to be the dwellings of spirits, and graves always have evergreens planted near by, perhaps as an abode for the departed soul. Old trees are especially sacred, and the reverence for Shinto temples is increased by the overshadowing trees. One of the most popular dramas of Japan is a play in which a female tree-spirit, in the form of a beautiful woman, marries a human, and for many years keeps secret the dependence of her life upon that of the tree.[3] Japanese mythology speaks of holy Sakaki trees growing on the mountains of heaven, and of an herb of immortality on the Island of Eternal Youth.[4] The Siamese have such dread of destroying trees that all tree-felling is relegated to the lowest criminals. Maspero says that Mussulman and Christian fellahîn alike worship at the present day the sacred sycamores that grow on the sands of Egypt, and beside them jugs of water are constantly replenished for travellers, who requite the benefit with a prayer.[5] The enormous Baobab is worshipped by the negroes of Senegambia. The Susa palm is sacred in Borneo, the Dragon tree in the Canary Isles. The Lotus of the East is found in Northern Africa, India, China, Japan. Persia and Asiatic Russia, and in all these countries is held sacred.[6]

The prevalence of tree-worship in Ancient Greece and Italy is seen by the number of trees dedicated to deities—as the oak to Zeus, the laurel to Apollo, the olive to Athena, the myrtle to Aphrodite. The adventures of Hercules in the garden of the Hesperides resemble the account of the forbidden fruit of Eden. The Argonautic Expedition was undertaken to recover a golden fleece that hung on a sacred tree. The oak grove at Dodona, founded by the Pelasgi, 1600 B. C., remained an oracle down to Constantine's time. The rustling of the leaves and the whirring of the sacred pigeons' wings combined

[1] *Cornhill Magazine*, Nov., 1872, pp. 598 and 601.

[2] Philpot: *op. cit.*, p. 13. References to tree spirits guarding the destinies of man are found in the *Tales of the Genii*, trans. from the Persian by Sir Chas. Morell, London, 1805.

[3] For these facts on Japanese tree-worship I am indebted to my friend Minosuke Yamaguchi.

[4] Philpot: *op. cit.*, p. 16.

[5] *Dawn of Civilization*, 1894, pp. 121-2.

[6] Folkard, p. 23.

to produce the sounds that were interpreted as oracles throughout the whole period of Greek history. Even when the sacred oaks were cut down, a piece of the wood in the boat's prow or keel was able to communicate to the sailors the will of Zeus.[1] As an oracle the Delphian laurel was no less famed than Dodona's oak. The sacred fig tree of Romulus was worshipped for centuries.

Certain trees in England are known as "gospel trees," because it was customary, in marking the limits of the parishes, to stop at remarkable trees, and recite passages from the gospels.[2] One of the best known examples of tree veneration among the Germans is the "Stock am Eisen," still standing in the center of Vienna. Into this tree every apprentice, until very recent times, before setting out on his *Wanderjahre* drove a nail for luck.[3]

Among North American Indian tribes the Omahas have two sacred trees, the ash and the cedar—the ash connected with beneficent natural powers and the cedar with destructive agencies. The Athapascans hold sacred the same two trees, because they were the first to be discovered by the gods. In the Osage traditions, cedar symbolizes the tree of life.[4] Among the Dakotas the tree which is to serve as the sacred sun-pole is cut down and taken to camp with great ceremony, no one touching it on the way or going in advance of it.[5] Darwin mentions a tree to which homage has been paid by offerings of cigars, bread and meat; and Tylor speaks of a cypress in Mexico, many centuries old, decorated with locks of hair, teeth, bits of colored cloth and ribbon. The Calchaquis of Brazil decorated sacred trees with feathers.[6]

A glance at harvest festivals, May-day celebrations and Christmas customs, shows them to be relics of tree-worship and survivals of the belief in the power of spirits to grant abundant vegetation in fruit and grain.

In earlier times the human representative of vegetation was sacrificed that the divine spirit in him might be passed on to his successor, and thus preserved without the loss of any vigor.[7] In winter vegetation is interpreted as being enfeebled, and must be slain and resurrected in fresher form. The death of the representative of the tree-spirit was thus for the purpose

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[1] Fergusson: *loc. cit.*, p. 17.
[2] *Flower Lore*, p. 28. "Dearest, bury me under that holy oak or gospel-tree."—Herrick.
[3] Fergusson: *op. cit.*, p. 22.
[4] *Eleventh An. Rep., Bur. Ethnol.*, Washington, p. 391.
[5] *Ibid.*, pp. 453-7.
[6] Dyer: *Folk-Lore of Plants*. New York, 1889. p. 37.
[7] Fraser, Vol. I, p. 240.

of quickening vegetation. In later times and among more civilized peoples, the representative of the spirit of fruitfulness is slain only symbolically, the custom surviving but losing its solemn character. Still later it becomes only a pastime, all knowledge of its significance being lost. The May-day customs of England are a survival of the festival of Floralia, introduced by the Romans. The significance of the custom is clearly seen in the variation of it by which the May-day procession left at each house a small tree or branch, thus bestowing prosperity and fruitfulness for the year.

The decay of meaning from the ceremonies can be traced in the different methods of representing the spirit—first, by a tree alone, then by a tree and living person, later when the savage nature of the rite has died out, by a tree and puppet, and lastly by a person only whose representative character is shown by the dress of leaves, the crown of flowers, or the name Queen of the May.

The autumn festivals are similarly a thanksgiving to the god of agriculture for abundant fruitage, and an invocation of future favor. The Jewish feasts[1] and Christian "harvest-homes" embody the same conception with the grosser elements omitted. The Greek feasts of Thargelia and Pyanepsia were later imitated in France and parts of Germany, by bringing home from the harvest-field on the last load of grain a branch adorned with flowers, ribbons and fruit. In all these customs the tree-spirit is conceived as the spirit of vegetation in general.

The Christmas tree is partly a survival and partly a revival of such customs. In the Christmas festivals of the Harz the maidens dance and sing around a fir tree which has been decorated with eggs, flowers, and other ornaments. Santa Claus, or Nick, is the demon treed in the branches and made to bestow gifts.[2] In Germany trees are married by being tied together with straw ropes on Christmas eve to ensure their yielding well. There is a similar custom in India. The belief in the fertilizing power of the tree-spirit is seen in the marriage rites of different peoples. In modern Greece the priest is provided with chaplets of lilies and ears of corn, which he places on the heads of bride and bridegroom as emblems of purity and abundance.[3] The myrtle, an emblem of purity and fertility, is still used in Germany for the bridal wreath, and in one part of the country the bride wears a gartér of flax as an invocation to the spirit of

[1] Lev. 23:39, 40; Ex. 23:16.
[2] Conway: *Mystic Trees and Flowers.* Fraser's Magazine, 1870, Nov. and Dec.
[3] Hilderic Friend: *Flowers and Flower-Lore.* London, 1884. p. 133.

fecundity. The custom in Brittany of giving a branch of laurel to a bride, and in Russia of placing a pine bough in her home, has the same underlying idea.[1] Even the orange blossoms of the present day, in England, France, and America, were first worn by Saracen brides as a symbol of fertility.[2]

The divining rod, still used in England and in this country for the detection of water-veins, is a survival of the sacred tree, with its magic powers. Rhabdomancy was in earlier times extensively employed in the discovery of minerals or of lost objects, and in bringing criminals to justice. The hazel is the favorite wood, though fruit trees have been largely used. The directions for cutting the bough are often elaborate, reminding one of other ceremonies connected with tree-worship: it must be that year's shoot, with a fork standing so that the sun from east to west shines through; it can be cut only between three and four in full moon Sunday morning. He that gathers it must walk in silence, with his face to the east, bowing three times and saying: "God bless thee, noble spray and summer's bough."[3] This form of divination was practiced, though forbidden,[4] among the ancient Israelites, and is mentioned in close connection with the worship of trees.[5]

Planting or dedicating trees to the memory of heroes or great events is the most modern form of tree worship. The "Charter Oak" in Connecticut, the "Liberty Elm" of Boston Common, the Ash trees of Mt. Vernon, the Penn tree in Philadelphia, are instances in our own country of making trees the "monuments of history and character."

This, given in the briefest and most unsatisfactory form, is the evidence. The question to be considered is: How came man to have such thoughts and feelings toward the trees? Spencer answers, "Plant-worship, like the worship of idols and animals, is an aberrant species of ancestor-worship—a species somewhat more disguised externally, but having the same internal nature;" and Grant Allen supposes trees to have become objects of worship by their association with the graves of the reverenced ancestors. But surely trees were believed to be sentient beings, and regarded as possessing a power which could be used to the disadvantage of man, long before ancestor-worship could have been possible or immortality conceived, because long before man had drawn any clear distinction between material and spiritual. Spencer himself, and Darwin as well, would give the germs of religious feeling to the higher

[1] Mannhardt: *Baumkultus*, pp. 222 and 46.
[2] Friend: *op. cit.*, p. 112.
[3] Grimm: *loc. cit.*, p. 975.
[4] Hosea 4:12.
[5] Hosea 4:13.

animals. But it would hardly be claimed that animals can retain for very long any thought of dead comrades, their imagination of objects not present to the senses being very limited. Nor have we any reason to suppose that their waking intelligence is greatly influenced by their dreams. In fact they are far from being capable of making any such abstraction as spirit apart from body.

To make ancestor-worship the origin of religion seems to be the exact opposite of the process which mental evolution has followed. Man did not begin with the distinct notion of himself as a being separate from all else in the universe, and later proceed to endow the objects surrounding him with his own mental characteristics. Rather, all nature was to him one, other animals and objects possessing the same mental qualities and powers as himself. Only much later did he begin to differentiate himself, and the real question is not, Why should primitive man have believed trees to be spirits? but, Why should he not? and How came it about later that he did not? And the real answer seems to be that man, through his developing self-consciousness, has got out of his primitive mental relation to the universe, has evolved an egoism which thinks the object of its own self-contemplation to be the only thing worthy of consideration and deprives all things else of the powers and qualities which are called "high," that is, of everything except materiality.

Primitive man, before he began to philosophize, or to analyze himself, was a part of nature, not knowing nor feeling himself a separate and higher thing than the rest of nature about him. He was a part or an element of the great unity; other things around him were similar to himself—able to think and feel. Why should he not ascribe life and spirit to such objects as trees which grew as he did; which possessed the power of motion within limited spaces; which uttered sounds no more unintelligible perhaps than the language of foreign tribes; which expressed by movements such emotions as anger or joy, that he himself showed by similar gestures? Why should not the strength of an oak inspire him with the thought that it was a powerful spirit? The distinction between body and spirit even in himself was vague at first; and is so still in the lowest races. Only to a very limited extent is abstract thought possible. The attributes of spirituality, as distinguished from those of materiality, are not well defined in the savage mind. Their gods, for example, are mortal, like men. This lack of mental ability in discrimination was conducive to the massing of all objects of nature under general characteristics, such as the man felt and knew in himself. It would be very improbable that he should be able to mark himself off clearly as a

different sort of being from others in nature with which he lived in such close contact. Only when he began to conquer nature and turn it to his account, and the philosopher awoke in him, did he begin to perceive himself superior to his environment. Only when he began to reason about his own soul, and lose his close relation to external nature, did he begin to question the possession of souls by the objects about him. Only when he turned his gaze within, and lost his former perspective, did he begin to imagine that *he* was the universe. The reversion from this perverted view is only taking place in the second half of the nineteenth century. The poets have never quite lost sight of the thought that man is only an essential part of the great unity of nature, and to them the trees, the flowers, and the streams, have ever been living things, of thought and feeling, desire and will. Children, too, representing the childhood of the race, have always believed trees to be alive and sentient, as a later section shows. Not only children, but even men of primitive stamp, show their atavistic belief in the intelligence and morality of inanimate things by kicking in anger an object that has injured them.

The general appreciation of nature, however, has grown up only within the memory of those living, and the philosophic thought of unity in the world is a modern concept. Along with this has come an appreciation of the myths of primitive peoples and a sympathetic understanding of their value in disclosing the mental life of the races from which these legends have descended.

This conception reverses the method of viewing the question of the origin of tree-worship, and of religion in general. Instead of the theory of the origin of worship which begins from the human side and makes the worship of other objects of nature merely secondary and accessory, through association, the present supposition would substitute a broader basis in the whole of nature, and carry the origin of the religious feeling far back to the pre-primitive period when man, just merging into humanity, did not consciously differentiate himself from all nature. The great gulf between man and lower nature, as he chooses to call it, has been fixed by man himself only in the later stages of his intellectual development.[1]

The pedagogic import of this is evident. Children are already and naturally in sympathetic *rapport* with nature. Our training of them must contain enough *letting alone* to allow this attitude toward nature to continue. This reverence for nature, and feeling of *at-home-ness* with her, is one aspect of the child-like

[1] These pages were written before I had seen Dr. Tylor's chapters on Animism. I am glad to find that part way we travel the same road.

spirit which surely need never be outgrown. Scientific dissection and classification of objects is as artificial and unsuited to child-mind as similar abstraction and generalization would be to the lowest savage.

From tree spirits to tree worship is an easy transition. When trees are regarded as powerful spirits, able to do good or evil, the primitive intellect is not slow to recognize the necessity of appeasing the wrath, and the advantage of gaining the favor, of such beings. Prayers and offerings are a natural consequence, and dendrolatry arises out of animism. No doubt in an age when the struggle for existence was fiercer and had fewer of the humanizing characteristics of civilized times, the gods, too, like men, were regarded as chiefly malignant, and this thought still survives in the variety of evil spirits, as elves, witches, dwarfs, lyeshy. But the good offices of trees, in furnishing shelter, protection, and food, were also recognized, and tree-spirits came to be regarded as predominantly beneficent. The sacred trees still worshipped in the times when subjective and objective are more clearly differentiated, are direct survivals of this mode of thought ; and the divining rod unquestionably gets its magic powers from its being the branch of a sacred tree. Trees planted in honor of some hero or dedicated to the memory of a national event, become objects of reverence by association. They are the representatives of the spirits held sacred.

It may be that trees do not stand on an equality with other objects of nature, with regard to animistic beliefs. The voices of the leaves, and the movement of the branches, of course give trees a greater likeness to men than noiseless and immovable objects possess. But in addition to this it is possible, in accordance with the preceding sections, that trees may hold a specific relation to man, that no other natural objects have. Man's arboreal life may have evolved certain intellectual and emotional characteristics, suggestions of which we still find in primitives and children. It may be, for instance, that the feeling of safety from enemies, afforded by the trees, developed an instinctive attitude toward these protecting objects, which survived far beyond the time of arboreal life, forming a basis in the evolving consciousness, of a special regard for trees, and a feeling that they were more powerful and more friendly than other spirits. Suggestions of this are seen in the great predominance of good tree-spirits over evil, and the universal worship of trees among primitive peoples, and in the unaccountable fondness of children for trees.

IV.

The Life-Tree.

Out of these relations between the tree and human life there comes another. We have only to carry the notion of tree-spirits a little farther to get a race of men born from the trees. In the earliest stages of primitive life the tree itself is believed to be a spirit. This, when the distinction between body and soul begins to be made, grows into the conception of a spirit inhabiting the tree. Later this spirit, as in the case of the Greek dryads, is able to leave its dwelling for a time, but cannot maintain its life quite apart from this habitation. This connection between life and tree, which has thus been growing less intimate and necessary, is at last entirely broken by a continuation of the same process; but a tradition of the earlier relations remains, and we have the myth of a human race descended from trees. Of the almost universal existence of such a myth there is ample evidence.[1]

In Norse legend the first human pair, Askr and Embla, were born of two trees, an ash and an elm, found on the sea-strand by Odin and his brothers. From these all mankind are descended.[2] Similar to this in Greek mythology is the formation of the brazen race by Zeus out of ash trees.[3] Both Greeks and Romans had a belief of origin from the oak. Virgil writes:

> "These woods were first the seat of sylvan powers,
> Of nymphs, and fauns, and savage man, who took
> Their birth from trunks of trees and stubborn oak."[4]

In Persian legend Ormuzd gave souls to a plant which had first grown up as single, and afterward divided into two. These became Maschia and Maschiâna, the parents of the human race.[5] The Mayas say they are "the sons of the trees," and an American Indian myth makes man spring from the trees. The Aztecs reverenced the tree-form, calling it the "tree of our life." The Mexicans believed the human race to have arisen from the seeds of their sacred moriche palm. In many parts of Germany a hollow tree is believed to be the abode of unborn infants. In a Finnish fairy-tale a foundling is called *punhaara*, tree-branch.[6] The poet's unity with nature suggests to him the same mystic relation.

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[1] Dr. Hall suggests to me that the myth of creation from trees might have arisen from the fact of earliest human life having been supported by the fruit of trees.

[2] *The Younger Edda*, tr. by Anderson, 1880, p. 64.

[3] Hesoid: *Works and Days*.

[4] *Æneid*, VIII, 314-5.

[5] Mannhardt: *Baumkultus*, p. 7.

[6] Grimm: *op. cit.*, p. 1451.

" I care not how men trace their ancestry,
To ape or Adam ; let them please their whim ;
But I, in June, am midway to believe
A tree among my far progenitors—
Such sympathy is mine with all the race."[1]

The same subtle sympathy was felt by Hawthorne toward the ash trees shading the manse at Concord.

The opposite process, of the transformation of mortals into trees, finds equally numerous illustrations. The sisters of Phaëton, changed into poplars, bewailing the death of their brother, on the banks of the river into which he had been hurled ;[2] Daphne, transformed into a laurel, to escape the attentions of Apollo ; Cybele, in anger changing her lover Attis into a pine, whose perpetual verdure was bestowed by Zeus in compassion for the remorse of the goddess ; Philemon and Baucis, whose spirits were transferred into trees, so that neither might witness the death of the other ;[3] the beautiful Thracian queen Phyllis, expiring of grief for the unfaithfulness of her husband, and transformed into an almond tree on the shore where she awaited his coming,—these and many others are classic examples. Buddha's many incarnations in trees have already been mentioned. Japan has a story of a faithful pair, who after enjoying many years of happiness, died at the same moment, their spirits passing into a tall pine, which a god had once planted in passing that way. On moonlight nights they may still be seen gathering the pine needles under the tree which is called the " Pine of the Lovers."[4] The Chinese have a legend telling how a husband and wife were transformed into cedars in order to perpetuate their love. A secretary of the king had a young and beautiful wife whom the king coveted, and to gain possession of her the secretary was thrown into prison, where he died of grief. To escape the king's attentions the wife threw herself from a high terrace, having left a request that she should be buried beside her husband. This the king in anger refused to grant, but from the two graves, though widely separated, there sprang two cedars which in ten days grew so tall and vigorous that their roots and branches interlaced, and the cedars were henceforth called " the trees of faithful love."[5] Among some South Sea Islanders the cocoa-nut tree is believed to be a transformed god, whose eyes and mouth appear in the fruit. The white kernel is commonly called " te roro o Tuna," *the brains of Tuna*.[6]

[1] Lowell.
[2] Ovid : *Metamorphoses*, II, 346-366.
[3] Ovid : *op. cit.*, VIII, 711 *et seq.*
[4] Mrs. Philpot, p. 83, quoting Rinder's *Old World Japan*.
[5] Folkard : *op. cit.*, p. 274.
[6] Gill : *op. cit.*, pp. 77-9.

From these two conceptions—creation from trees and transformation into them—arises the more specific notion of a sympathetic connection between the life of a person and that of some particular tree. A Czekh story tells how a child, born of a mortal and a tree nymph, was able to hold converse with her mother by means of a pipe made from twigs of the willow tree which her mother had inhabited. Among the Romans it was usual to plant a tree at the birth of a son, and this custom is still prevalent in America, England and France, as well as in Italy. In Switzerland an apple-tree is usually planted for a boy, and a pear-tree for a girl. The life of the child is believed to be so intimately associated with that of the tree that he will thrive or fade according as it flourishes or withers.[1] The Dyaks of Borneo plant a palm ; in Bali a cocoanut tree is planted and called the child's "life-plant." Such trees are cared for with an almost superstitious devotion. Byron believed that his life and prosperity were bound up in an oak planted when he first visited Newstead, and on its fate depended his. The sycamore tree of the Cary sisters is well known.

The sympathetic relation sometimes extends to whole tribes or sects, as in the case of the patrician and plebeian myrtles before the temple of Quirinus, whose vigor depended upon the fortunes of the two political parties ; or the weeping willows in sympathy with the sorrows of the Israelites.[2] The Italian belief that the bay-tree withered and died at the approach of a national calamity is preserved by Shakespeare.

> "'T is thought the king is dead; we will not stay.
> The bay-trees in our country all are withered."[3]

Every one knows the mediæval legend that the aspen, being compelled to supply the wood of the cross, has never since ceased to tremble.

The earlier connection of trees with family interests is illustrated by the prevalence of family names derived from trees, as Linde, Eichbaum, Birkmayer, in Germany, and the English Holyoake, Ash, Maple, Rowan, etc., and is emphasized by folk-tales which give rise to such stories as Julian Hawthorne's *Kildhurm's Oak*.

The curative power of trees, and the sympathetic connection existing between a tree and a child who has been passed through a cleft branch, will be mentioned later.

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[1] Mannhardt: *Baumkultus*, p. 50.

[2] Ps. 137:2. In its name, *Salix Babylonica*, the willow preserves the memory of this incident by the waters of Babylon.

[3] Richard II, Act. II, Sc. 4.

V.

The World-Tree.

The conception of a world-tree is so wide-spread that it must have arisen independently among different peoples. It arose perhaps as an explanation of how the heavens were supported and the stars kept in their places. Many children think that the sky is held up on the tree-tops.

The Scandinavian ash, Yggdrasil, is the best known of the universe-trees. "By this tree is the chief and most holy place of the gods, where they meet in council every day. It is the best and greatest of all trees; its branches spread over all the world, and reach up above heaven. Three roots sustain the tree and stand wide apart; one root is with the Asas (gods), and another with the frost-giants; the third reaches into Niflheim (nether world); under it is Hvergelmer (fountain) where Nidhug (serpent) gnaws the root from below. But under the second root, which extends to the frost-giants, is the well of Mimer, wherein knowledge and wisdom are concealed. The third root of the ash is in heaven, and beneath it is the most sacred fountain of Urd. Here the gods have their doomstead. The Asas ride hither every day over Bifrost (rainbow), which is also called Asa-bridge . . . . Thor goes on foot to the doomstead and wades the rivers.

> When he goes to judge
> Near the Yggdrasil ash;
> For the Asa-bridge
> Burns all ablaze,—
> The holy waters roar.

The red which you see in the rainbow is fire burning over Bifrost. The frost-giants and the mountain-giants would go up to heaven if Bifrost were passable for all who desired to go there. Many fair places there are in heaven. . . . There stands a beautiful hall near the fountain, beneath the ash. Out of it come three maids, who shape the lives of men, and we call them norns. Good norns and of good descent shape good lives, but when some men are weighed down with misfortune the evil norns are the cause of it. . . . On one of the boughs of the ash sits an eagle who knows many things. Between his eyes sits a hawk that is called Vedfolner. A squirrel, by name Ratatosk, springs up and down the tree, and carries words of envy between the eagle and Nidhug. Four stags leap about in the branches of the ash, and bite the leaves. More serpents than tongue can tell gnaw the roots of the tree. The norns that dwell in the fountain of Urd, every day take water from the fountain, and take the clay that lies around the fountain, and sprinkle therewith the ash, in order that its branches may not

wither or decay. This water is so holy that all things that are put into the fountain become as white as the film of an egg-shell.

> Thence come the dews
> That fall in the dales.
> Green forever it stands
> Over Urd's fountain.

When Odin sits in his high seat he sees over all the world. In the southern end of the world is the palace which is the fairest of all, and brighter than the sun. It shall stand when both heaven and earth shall have passed away. In this the good and the righteous shall dwell through all ages."[1] In Valhal is a chest which contains the golden apples which the gods must eat to make them young again.

The inhabitants of the tree are supposed to be natural phenomena. The serpent Nidhug who gnaws the root in the lower world is volcanic force; the stags who bite the leaves and buds are the winds; the eagle and the hawk are the air and the ether; the squirrel running up and down the tree is hail; the leaves of the tree are clouds; its fruit, the stars; the swans swimming in the fountain typify sun and moon.

Perhaps the oldest world-tree known is that which grew at the mouth of the Euphrates, near a city which flourished three or four thousand years before the Christian Era. To plain-dwellers the tree is the loftiest and most impressive object in their experience, and it is suggestive that the origin of this world-tree is located in the garden of Eden, on the plains bordering the Persian Gulf. The fragment of a hymn reads:

> "(In) Eridu a stalk grew overshadowing; in a holy place did it become green;
> Its root was of white crystal, which stretched toward the deep.
> (Before) Ea was its course in Eridu, teeming with fertility;
> Its seat was the (central) place of the earth;
> Its foliage was the couch of Zikum (the primeval) mother.
> Into the heart of its holy house, which spread its shade like a forest, hath no man entered.
> (There is the home) of the mighty mother who passes across the sky.
> (In) the midst of it was Tammuz.
> (There is the shrine) of the two (gods)."[2]

The roots of this tree reached down to the watery deep, the dwelling place of the god of wisdom, Ea; on the branches rested Zikum, the primordial heavens, and below was the earth. The trunk of the tree was the home of Dav-kina, the great mother, and of Tammuz her son, whose temple mortals might not enter. Such a conception must have come from a tree-

[1] *The Younger Edda:* trans. by Anderson, 1879, pp. 72-76.
[2] A. H. Sayce: *Religion of the Ancient Babylonians*, The Hibbert Lectures, 1887, p. 238.

worshipping nation. "The mighty stem in which the great gods dwelt was but a poetical amplification of the sacred spirit-inhabited tree, and arose out of the same idealizing process as that which gave birth to the nearly-related tree of knowledge and tree of life."[1]

In the Indian cosmogonies there are world-trees of many names, as emblems of immortality and of universal life—sacred trees bearing ambrosia, the food of the gods, growing beyond the mystic river whose waters give eternal youth; cloud-trees with shadows producing day and night before the creation of the sun or moon, growing in the midst of flowers and rivers, imparting all riches and knowledge, satisfying all human longings, and conferring perfect bliss; universe-trees, which become, in the Rigveda, Brahma himself, with all the other gods branches of the divine stem. Closely parallel with these is the world-tree of the Buddhists, giving wisdom, furnishing immortal food, protecting the souls of the blessed. It sparkles with precious stones, the stars, and is laden with divine flowers. Under this tree it was, that Buddha fought his battle with the tempter, on a night forever after sacred to the Buddhists, and gained the victory which gave him possession of the tree of knowledge and the freedom which comes through truth. Very similar also is the Haoma of the Zoroastrians, planted in heaven by Ormuzd, scattering its thousand seeds to all the parts of the earth;[2] and the sacred tree of the Assyrians, Phœnicians and Israelites, which represented the great Deity, and was worshipped as a symbol of Him.[3] China and Japan have their universe-trees, the former a huge pine growing at the center of the world, the latter seven miraculous trees conferring immortality.

But ancient and oriental nations are not the only peoples among whom is found this conception of a tree overshadowing and protecting the world or yielding the fruit of wisdom and immortality. Traces of such a tree are found in Russian legend —a tree whose root is the power of God and whose top sustains the heavenly ocean of air, the earth and hell. Among the Finns the Kalevala, their national epic, tells how a mighty oak sprang from a magic acorn planted by Wainamoinen, raised itself above the storm-clouds, dimming the sunlight, hiding the moonbeams, causing the stars to die in the heaven, until the hero, alarmed at its growth, appeals to his mother, the wind-spirit, who sends forth a dwarf grown into a giant, whose

[1] Philpot: *op. cit.*, p. 112.
[2] Sacred Books of the East, edited by Max Müller, Vol. XXIII, *The Zend-Avesta*, Pt. II, p. 173.
[3] Folkard: *op. cit.*, p 6.

might overcomes the oak. It falls and its power to bestow good is only then discovered:

"Eastward far the trunk extending,
Far to westward flew the tree-tops,
To the south the leaves were scattered,
To the north its hundred branches.
Whosoe'er a branch has taken
Has obtained eternal welfare.
Who secures himself a tree-top
He has gained the master-magic.
Who the foliage has gathered
Has delight that never ceases."[1]

Even among the North American Indians there are traces of such a tradition. A tribe of New Mexico has in each of the six points of the world (the four compass points, zenith and nadir), a mountain bearing a tree—spruce, pine, aspen, cedar, and two oaks. At the foot of each tree dwells a "cloud ruler," attended by a priestess of the tribe whose duty it is to intercede with the god to send rain.[2] The connection here between the tree and the sky is so evident as to suggest that the primitive gods came to be believed to occupy a position *above* the earth through their having inhabited the trees. The highest objects in nature, that are not separated from the earth, are trees and mountains. But mountains were not believed to be inhabited by spirits as trees were. They do not possess the life and movement of trees, nor grow as trees do. They have no voices, and cannot show anger as trees do in a storm. In these things trees are like men, to the primitive mind, and their importance far surpasses that of inanimate objects. It seems more probable, then, that the gods have reached the sky through the trees than by the mountains or by means of any other natural objects.

VI.

The Paradise-Tree.

Closely connected in thought with life-trees and world-trees are the trees of Paradise. If men are born from trees, our ancestors would naturally be thought to have had their original home amongst trees. If the tree of the universe had its topmost branches in heaven, the conception of a Paradise might easily grow out of this form of tree-worship. The sorrows of human life, and its disappointments, its ceaseless toil without recompense of love or pleasure, creates in the heart a longing for some happy, far-off land where blessedness abides. What more natural than that this should be found

[1] *Kalevala*, 2nd Rune, trans. by John Martin Crawford, N. Y., 1891.
[2] *Bureau of Ethnology*, Washington, 11th An. Rep., p. 28.

with the gods, beneath the trees which dropped ambrosia, in a garden of fragrance watered by life-giving springs and rivulets. That many peoples had such a conception, as the dwelling-place of the gods, of their own first parents, or as their future abode, is unquestioned. In a tradition of the Parsis the first man and woman, who were born from a tree, were placed in Heden, where grew the Tree of Life which gave strength and immortality. The Hindoo religion has a garden of the great god Indra, containing the trees which first grew out of the troubled waters at the beginning of creation, with their life-giving fruits and beautiful flowers. The chief of these trees was the Paridjata, whose flower was fresh all the year through and gave to each person his favorite color and perfume. Besides insuring against hunger or thirst, it had uses more spiritual for it was a test and token of virtue, losing its freshness in the hands of the wicked and preserving it with the upright.[1]

The Paradise of Mahomet is in the seventh heaven. In the center of it is the great tree Tooba, so large that a man could not ride around it on the fleetest horse in a hundred years. This shows its close relation to the immense universe-trees. This tree affords shade to all Paradise, and bears fruit of a size and taste unknown to mortals. The branches even bend low to bestow their delicacies at the wish of their inhabitants. From this tree the rivers of Paradise flow with milk and honey, water and wine.[2] The Zend-Avesta has two Haoma trees; one yellow or golden, which is earthly and the king of haeling plants; the other the white Haoma or Gaokerena, which grows up in the middle of the sea, surrounded by ten thousand healing plants, by drinking the juice of which on the resurrection day men become immortal.[3] It was from this celestial tree that the full perfection of the world arose. It is "the counteractor of decrepitude, the reviver of the dead, and the immortalizer of the living."[4] The Japanese have a similar legend of an Island of Eternal Youth from which a tree rises high above the waters; endless springtime is there and the miracle of spring in other lands is caused by the whisper of the spirit of this island.[5] In the Hebrew Paradise, the garden of Eden, stood the tree of life in the center.[6] The significance of this tree no one really knows. According to the Rabbins it was a supernatural tree of such vastness that no man could

[1] Folkard, p. 10.
[2] Folkard, pp. 10-11.
[3] *Zend-Avesta*, Pt. I, Vol. IV of *Sacred Books of East*, p. LXIX.
[4] Vol. V, *Pahlavi Texts*, Pt. I.
[5] Mrs. Philpot, quoting Rinder's *Old World Japan*.
[6] Gen. 2:9.

travel round it in less than five hundred years. From beneath it gushed forth the waters of the earth refreshing and invigorating all nature.[1] It resembled in fact the world-trees of the previous section. Others make it emblematic of the life that Adam and Eve received from God. At any rate it resembles the Paradise-trees of other nations in yielding a fruit which would confer everlasting life, for after the transgression of eating the forbidden fruit of the tree of knowledge of Good and Evil, and thereby making themselves unworthy of a continued existence in a garden of delight and near the presence of the Lord, the first parents were driven from Eden lest they should put forth their hands "and take also of the Tree of Life and eat and life forever."[2] The Christian sacred scriptures use the Tree of Life with the same signification: "to him that overcometh will I give to eat of the Tree of Life which is in the midst of the Paradise of God"[3]—a direct reference to the loss of the privileges of Eden through disobedience and the regaining of the lost heritage through faithfulness. The conception has a further point of parallel with the sacred trees of other nations in the healing properties of its leaves, mentioned by Ezekiel several centuries before Christ, and later in the apocalypse.[4]

Growing by the Tree of Life in the garden was the forbidden tree of knowledg of Good and Evil,—"good for food and . . . . pleasant to the eyes, and a tree to be desired to make one wise,"[5]—the identity of which has given rise to so much speculation. The prevailing tradition makes it an apple tree, though the Bible offers no support to this.

A Jewish legend tells how Adam at the age of 900 overtaxed his strength in uprooting a large bush, and feeling that death was threatening him, sent his son Seth to the angel guarding the way to the Tree of Life, to ask for some of its fruit to renew his strength. Seth was given three seeds and charged to place them in Adam's mouth when he was buried. These grew up as an olive, a cedar and a cypress, but their existence was not known until the time of Moses who was ordered to cut them down. Moses, and afterwards David, performed many miracles of healing with these rods. They later grew into one tree and furnished the wood for the cross of Christ. This legend preserves the fundamental idea of the eternal-life-giving power of the Tree of Paradise. An interpretation, ingenious if fanciful, of the first chapter of Genesis makes the tree of life the human body,

[1] Folkard, p. 13.
[2] Gen. 3:22.
[3] Rev. 2:7.
[4] Ezek. 47:12; Rev. 22:2.
[5] Gen. 3:6.

and the flaming sword which turned every way to guard it the blood. A similar explanation, quoted in Warren's *Paradise Found*, makes the brain the tree of life, and the blood the water of life. An idea related to this, and carried out in detail, is found in one of the sacred books of the East. A forest has seven large trees of seven fruits, seven guests, seven forms of concentration and of initiation. The probable interpretation is that the forest represents life, with the trees as the five senses, the understanding, and the will,—called trees because producers of the fruits, namely pleasures and pains, derived through them. The guests are the powers of each sense personified, the forms of concentration are the exclusion from the self of the functions of the senses, and the initiations are the entrance into the higher life by repudiating as not one's own the actions of these senses. When this forest disappears, that is, when the senses have become absorbed into the self, another tree springs up, which is intelligence and whose fruit is emancipation and shade tranquillity.[1] This again expresses the fundamental idea of the paradise tree, namely everlasting life, but in this case according to the Hindu conception of it as Nirvana.

In all these growths of religious thought concerning immortality and happiness the central idea is the tree, and the attainment of the life of unending felicity is by partaking of the fruit of this tree. Placing beside this the primitive notion that heaven was not far away, and that its occupations were similar to those of earth, we have the necessary material from which to draw the conclusion, actually arrived at by many peoples, that heaven could be reached by climbing a tree if one could only be found tall enough. The Accadians pictured the sky as the counterpart of their own Babylonian plains; the sun was a ploughman yoking his oxen to his glittering plough, and the planets were sheep.[2] The Bedouins of Arabia believe that the jinni, who live near the lowest heaven, can hear the conversation of angels.[3] The Mbocobis of Paraguay believe departed souls to go to heaven by the tree that joins it with earth, entering by the holes through which the rain descends,[4] and the Idaan of Borneo reach paradise by crossing a long tree.[5] The Khasis of India have a legend which makes the stars men who have climbed to heaven by a tree.[6] Milton's picture would allow of such an interpretation :

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[1] *Bhagavadgítá, Sanatsugátiya and Anugítá*, pp. 285-6.
[2] Sayce : *op. cit.*, p. 48.
[3] Bent : Nineteenth Century, Oct., 1895, p. 608, *The Land of Frankincense and Myrrh.*
[4] Tylor : *Early History of Mankind*, 1878, p. 358.
[5] *Ibid.*, p. 360.
[6] Mrs. Philpot, quoting Goblet d'Alviella's *Migration of Symbols.*

"'Overhead up-grew
Insuperable height of loftiest shade,
Cedar, and pine, and fir, and branching palm;
. . . . . Yet higher than their tops
The verdurous wall of paradise up-sprung . . . .
And higher than that wall a circling row
Of goodliest trees, loaden with fairest fruit.'" [1]

The ascent to heaven by a tree is found in myths among peoples so widely separated that an independent origin must be admitted. To those given might be added the story current among the Wyandots of a boy who climbed a tree so high that he found himself in a beautiful country, where he caught the sun unawares in a trap set for game; the other sun-catcher, among the Dog-Rib Indians, who had climbed a tree in pursuit of a squirrel until he reached heaven; the Dyak who brought rice to mankind by climbing a huge fruit-tree which was rooted in the sky, with branches hanging to earth; the Malay legend of Kasimbaha who ascended to heaven on the rattan tree to recover his wife, a celestial nymph who had deserted him; and our own nursery tale of Jack and the Beanstalk, which is a disguised representative of this group of myths.[2] If such myths have arisen independently among many peoples, and are not the result of some happy inspiration of a single soul, their origin must have some natural cause. This is doubtless found in the fact of universal tree-worship in the earlier stages of civilization. The tree being thus a sacred object would be closely connected in primitive thought with the idea of a divine habitation, when the gods began to be farther removed from the earth; and if the idea of such a habitation as *upward* was already in men's minds, this would suggest a further connection. May we not, however, go farther back, and say that the idea of *up-ness* itself as an attribute of heaven, and later a symbol of goodness, owes its origin to tree-worship? The idea of the gods in council, ruling the world, is a much later conception than tree-worship. When it became necessary that an assembly of gods should have a more definite location, why should not that be chosen by the primitive mind where so many of the gods already existed, namely, above the earth? This does not conflict with the notion that deities were believed to be in the sky as early as upon the earth, that the sun was worshipped in as early an age as trees. But when fetishism grew into polytheism proper some explanation must be given of how the gods of the earth, which formed the great majority, found their general dwelling-place above the earth.

[1] *Paradise Lost*, Bk. IV, 137-147.
[2] Tylor: *Early History*, pp. 350-6.

VII.

The Tree in Medicine.

The tree has played an important part in the cure of diseases. The most common form of treatment has been the transference of the ailment, by some magic word or symbolic act, to the tree, or rather to the tree-spirit; for here too we meet with the same underlying notion of the intelligence and personality of trees. They are believed to be subject to the same ills as those which afflict humanity; if these ills, then, can be passed over to the trees, the suffering person is relieved. The method of this transference also is a survival from the primitive beliefs regarding the way in which spirits inhabit objects, and can pass from one to another. It belongs to a later period than that in which objective and subjective were identified; a period, namely, in which the souls of men and of other objects were able to leave their usual dwelling-places, but could not exist without some habitation. As a consequence of this dependence of the spiritual on some material support, the transference of a man's disease to a tree which might happen to be distant could be effected by an object passing between the two as a medium. When possible, however, the afflicted person is brought into direct contact with the tree. All this is not merely an analogy, for when these methods were employed diseases were actually believed to be evil spirits, which were induced to leave the man when some other suitable dwelling-place was furnished them.

In England, not so long ago as a century, ash trees were split open and held by wedges while children were passed through as a cure for rupture.[1] These trees were often preserved with great care, a mysterious connection being supposed to exist between the tree and the patient,[2] In Austria the ceremony is more elaborate. A branch of oak is split open and the child passed through backward three times. The pieces are then tied together with the child's shirt and thrown on the fire, all being done in silence.[3] In the middle ages a hole formed by the growing together of two branches was believed to be exceptionally efficacious, and such trees were visited from great distances. Near Wittstock stood a stout gnarled oak whose boughs had thus grown into each other, and all around the tree lay crutches that had been thrown away by those who no longer needed them.[4] To crawl beneath a bramble which

[1] *Gentleman's Magazine*, June, 1804, and White's *Natural History of Selborne*, 1789.
[2] *Gent. Mag.*, Oct., 1804.
[3] Conway: *loc. cit.*
[4] Grimm: *loc. cit.*, p. 1167.

had formed a second root in the ground was said to cure rheumatism. For the whooping-cough the child must be passed from side to side seven times, during the repetition of some mystic words which transferred the cough to the bramble. In Thuringia to be cured of the gout one must climb a young pine and tie in the topmost branch a knot, saying: "Pine, I bind here the gout that plagues me." Another method is to go three successive Fridays after sunset under a fir tree and say to it: "Fir tree, I complain to thee, the gout torments me sore."[1] A Flemish cure for ague directs the patient to go early in the morning to an old willow tree, and tie three knots in one of its branches, saying: "Good morning, old one, I give thee the cold, good morning, old one." A fever is transferred to the elder by saying: "Lift thee up, elder bough! Antony's fire, sit on it now! I've had thee a day, thou have it alway."[2] In the island of Carpathus the Greek priest ties a red thread around the sick person's neck. Next morning it is removed by friends and tied to a tree on the hillside.[3] In some of the East Indian Islands epilepsy is treated by striking the sufferer on the face with leaves, which are then thrown away, the disease going with them. Toothache is believed in Northern Europe to be cured by sticking an elder-branch into the ground with the words: "Begone, bad spirit." Ague is cured in the same way, and the next person who comes to the spot gets it.[4] In Oldenberg a remedy for toothache is to bore the tooth with a nail until it bleeds and then drive the nail into an oak where the sun will not shine on it.[5] Another cure for ague is to make a gash in a lofty willow, breathe into it three times, and closing it quickly, hasten away without looking back.[6] The evil spirit is thus breathed into the tree and there imprisoned—this superstition being doubtless an outgrowth of the idea of spirit and breath being one. Similarly, contact with holes in the trees, through which the spirits pass in and out, is a very effective treatment of various troubles.

Prominent in folk-medicine is the belief in the magic powers of trees and flowers. The underlying thought is still that of an indwelling spirit in the plant, the good-will and co-operation of which is secured by certain invocations and ceremonies. In the *cure* of diseases this beneficent spirit of the tree, embodied usually in the fruit or a branch, is powerful enough

[1] Grimm: *op. cit.*, p. 1170.
[2] *Ibid.*
[3] *Blackwood's Magazine*, Feb., 1886.
[4] Grimm: *loc. cit.*, p. 1170.
[5] Conway: *loc. cit.*
[6] Folkard, p. 98.

to drive out the evil spirit of the disease ; in the *prevention* of ills, the tree-spirit prohibits the entrance of the other. Thus elder is worn as a protection against epilepsy ; a juniper-plant bearing green berries along with ripe ones is effective against smallpox and witches ; in Russia the chestnut is efficacious for backache and gout ; the sap of dogwood, absorbed in a kerchief on St. John's eve, will fulfill all wishes ; grass blades confer second sight, and the sod from which they grow is a protection against witches ; inimical to witchcraft are also the elder, hazel, mistletoe and holly ; in Cornwall mountain-ash is carried as a charm against the evil eye, and as a cure for rheumatism ; a beverage prepared from the mistletoe was thought by the Druids to be a remedy against all poisons, and this same magic plant, representing the general spirit of vegetation, is highly favorable to fertility in human and animal species. The ancient Persians regarded it as a universal healer.[1] The Zuñi Indians venerate a magical plant, the *Tênatsali*, which produces the most beautiful flowers of all colors, and is a cure for all ills.[2] The Bohemian poacher thinks he can make himself shot-proof by finding on St. John's Day pine cones on the top of a tree and eating one each day. It is a Suabian belief that the same result will be brought about by any one who on Friday of the full moon pulls up the amaranth and carries it folded in a white cloth against his breast.[3] Scotch milkmaids wear mountain-ash charms as a protection against lightning, this custom originating in the resemblance of the red berries of the ash to the flowers of the sacred lightning-tree of the Hindoos.[4] On the *Walpurgisnacht* German witches gather ferns to render themselves invisible.

In Cockayne's curious volumes on the *Leechdoms, Wortcunning and Star-craft of Early England* are given many examples of the magic power of plants and trees. The juice of the Θεογγελὶς, or gospel plant, was drunk by the magi before divination ; the γελωτοφυλλὶς produced laughter ; the Θεῶν βρώτιον, food of the gods, kept the kings of Persia in health and vigor of mind ; another herb secured handsome and good children ; and Apollodorus knew a preparation that made fading love revive.[5] He who sleeps under sacred trees receives in a dream such wisdom as leads to the restoration of his health.[6] Sleeping beneath the boughs of the laurel, or on

[1] Bonwick : *Irish Druids and Old Irish Religions*, London, 1894, p. 236.
[2] Folkard, p. 109.
[3] Dyer : *The Folk-Lore of Plants*, New York, 1889, p. 282.
[4] Sara E. Wiltse : *Myths and Mother-Plays*, 1895, p. 31.
[5] Cockayne, p. xiii.
[6] Robertson Smith : *op. cit.*, p. 169.

mattresses composed of its leaves, brought prophetic visions and poetic inspiration.[1] The Sibyl who gave the answer of the god to those who sought counsel of the Delphian oracle, shook the sacred laurel, and sometimes ate the leaves, before becoming inspired. The Mandrake has always been thought to have a close and mysterious connection with human life, as may be seen even from its names, the English *Earthman*, German *Galgenmännchen* (gallows-man), Latin *Semihomo* (half-man), Greek *Anthropomorphon* (man-shape). It has always been supposed to possess supernatural powers, and to be the bearer of good fortune. It is still worn by the Greeks as a love-charm, and by many people is still believed, as it was by the Israelites 4,000 years ago, to be potent against sterility.

The sacredness of such plants and trees, that is, the power and good-will of the indwelling spirit, is the secret of their effectiveness as the bearers of good and preventers of evil. In view of this explanation one would expect to find plants whose magic powers produce illness or misfortune, since there are evil spirits in the vegetable world. This expectation is of course fulfilled, though the ill-disposed are found rather among herbs than trees, in accordance with the principle already deduced, that tree-spirits are on the whole beneficent.

VIII.

The Tree in Child Life.

If individual development is an abbreviated race-history, one should meet with some instructive parallels between primitive peoples and children, in their feelings towards nature. The returns to a syllabus sent out by President Hall in 1895, have made it possible to indicate with some assurance certain of these resemblances. That the notions and feelings of childhood are deeply tinged with animism there can be no question. Children ascribe to trees not only sentience, but intelligence, emotion, morality,—in a word, all the mental powers of which they themselves are possessed. To illustrate so general a statement, one must reproduce in some detail the child's feelings, as recorded by his elders, or by himself later in life.

That trees and flowers are believed to have physical feeling, and suffer when trimmed or cut down, is shown by replies which contain such phrases as these: Chopping down trees is cruel, for they feel pain as we do when injured; shame to hurt trees so; positive discomfort, at 18, to see trees trimmed; seemed as if their arms and legs were being cut off; disliked people who trimmed trees; must hurt large trees to fall so far

[1] Folkard, p. 106.

when uprooted by storm; sap oozing out is tree crying or bleeding; when tree was felled it seemed like the loss of a friend.

The likeness in the child's mind between the tree and himself is seen to be very close, and worked out in detail: the limbs, trunk and roots are its arms and feet, the leaves are its clothing, the bark its skin, from which when bruised or cut the sap oozes as blood. Such myths as that of the Greek hamadryads, whose life-blood was seen to flow from the injured tree, are here revived in the child-consciousness. But this personification of trees, which is merely myth or poetry to adults, is serious philosophy to the child. The resulting feeling of sympathy for trees and flowers, and readiness to champion their cause with the thought of relieving their suffering, is a trait which may well be encouraged in the boy and girl. The fact of its having so solid a basis in instincts that are the outgrowth of race history has probably contributed not a little to the success of Arbor Day.

The remarkable companionship and understanding between trees and children is illustrated by the confidence the children have that all this is appreciated by the trees: They like to have little boys and girls around; make shade just for the children; two big oaks watch over our house and take care of us; spread their arms over us, like good mothers; tree cried because lonesome; get lonely if have not children to play around them. The birds and trees are close friends, and understand one another's needs and wishes: Birds the best playmates trees have, they sing so nicely and put the leaves to sleep, and the flowers; trees glad when birds come back from South; trees feel happy and honored when birds build nests in them; try to stop the birds from going past, by holding out their hands to them.

A companionship between the trees themselves is many times mentioned. This includes a close sympathy and an understanding of one another's feelings and wishes. The interchange of thought through language sometimes extends only to trees of the same species, but oftener to all kinds: trees talk to each other just as people do; they sometimes laugh loudly; sympathize with one another when a branch is broken; want to shake hands when they sway together; love each other when they grow close together; often say "good-night" to one another; rustling of leaves is whispering of fairies who live in them; wind blowing through branches is leaves singing their babies to sleep; trees of same kind like to be planted next each other, for if an elm is planted near a maple it would be like putting an American girl with a little Dutch girl, and they would be lonely, not being able to understand. Trees can understand the children's talk, and the trees' language is usually intelligible to the child.

F., 6. Walking in woods, looked up suddenly to the leaves and said, "Oh, I am only going a little way." When asked to whom she was talking, replied, "Did n't you hear those leaves ask me where I was going?"

F., 10. When wind blows mournfully the leaves say, "I am sad, I am sad;" when branches snap they say, "I am mad, I am mad."

M., 4. "I love you, flowers, but you never say anything to me. When are you going to get old euough to walk and talk? Do you like me? Why don't you answer? You are the worst children I ever spoke to. I'll leave you all alone, and then you'll be afraid. Goodbye."

M., 10. Trees get angry at the wind, and scold and scream and slap it.

F., 5. Talks to trees by the hour, and understands their questions.

6-10. Favorite amusement of a group of children to sit under the trees and listen to the leaves tell stories.

The animism of childhood, which makes even the use of language possible between the child and the tree, surpasses even that of primitive peoples in the completeness with which the objects of nature are endowed with human attributes. Though animate nature had voices, yet they were rarely believed to be intelligible to man, except in such cases as the Greek oracles. It may be that the imagination of the civilized child is more active than that of the primitive adult, partly, perhaps, because the stimulus is more varied. But whatever the cause, the result can be turned to account by teacher and parent. If living thus close to nature brings the calmness of life and the sweetness of character, of which the poets tell us, it is surely worth our efforts to help the children retain their *naive* attitude toward their world, by encouraging their direct contact with nature and by furnishing them with myth and legend to keep the actual from breaking in too early and too rudely upon them. Even for ourselves, if we are not too hopelessly past this stage, it might be a gain to throw off the artificiality and pettiness of life, and attempt to get back nearer to the heart of things and into closer harmony with the universe. Interpret the phrase as you will. To the Brahman it would mean something like the rest of Nirvana; to the every-day Christian, who sees the Creator in His works, it would be "peace in God;" to the philosopher it might be the feeling of comfort that he was catching a glimpse of the meaning of all things. From such moments we should go back to the world of men bearing some "sweetness and light," which, whatever be our philosophy of life, is a consummation to be wished.

The belief that living with the trees and the flowers has such an effect on character is supported by the careful observation of teachers, who are positive in their assurance that the children who do not believe trees to be alive and intelligent are the ones who lack the "finer feelings." A comparison of sexes as well

as of ages bears this out. The boy's nature is more apt to grow coarse than the girl's, and at an earlier age, and it is very noticeable that boys sooner than girls reach the period when they are ashamed of their animistic beliefs.

The sense of right and wrong is as evident as the intellectual endowments of trees. Some children think all trees and flowers good, but the consensus grants goodness only to those that are shady, or beautiful, or fruit-bearing, or that offer a protection to the birds. Those that are bitter, poisonous, prickly, unfragrant, or deceitful (*e. g.*, the candock making one believe it at a distance to be a water-lily), are accounted evil. This is a strongly utilitarian ethics, but has advanced beyond the egoistic stage. "Trees that cast no shadows are selfish," and selfishness is bad. This is a morality doubtless which has been already taught to the child, yet if he be a true representative of the race, he might in some measure, without instruction from elders, reach that standard, at the time when his life is epitomizing the stage of race-evolution which was no longer characterized by the fierce struggle for individual existence, but showed evidences of the higher struggle for the life of others.

The retribution which follows wrong doing is visited also upon the trees. Very often "crooked trees are bad ones, and God made them that way so that no one would love them."[1] In other cases crooked trees are merely unfortunate, and receive a great deal of sympathy. This difference of attitude may be largely due to the child's training, though partly to native kind-heartedness.

The feelings of reverence and worship in the child's heart it projects into the trees, finding analogies in the action. To them

> "Nature with folded hands seems there
> Kneeling at her evening prayer."[2]

F., 18. Once said after shower when everything was fresh: "How bright the flowers and trees are. They are looking up and thanking God for the rain. Don't you think so?"

F., 17. Thought the daisy was praying when it had its petals folded seemingly under its chin.

F., 11. Thinks God comes into the trees at times, out of the clouds when they touch the tree tops. All *white* flowers are angels.

M., 9. Wondered if the spirits of trees went to heaven.

M. The trees sing to the moon and stars.

F., 19. Flowers and leaves opened at night when they were kissed by the moon, which took all their tiredness away, and made them bright and happy.

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[1] Among primitive myths it is common to find one in which the evil spirit made ugly and distorted trees while the great spirit was sleeping.

[2] Longfellow.

Social feelings and even conventionalities are not forgotten by the trees. They put on new dresses by changing color, get their dresses wet when it rains, put on green dresses because glad the birds are coming to build nests in branches, are ashamed when the leaves drop off.

The affection which children bestow upon the trees has been observed by every one, and need only be briefly sampled here:

M., 3. Can't pass a tree in his walks without putting his arms around it.

F. When 6 had been away for long visit, and when returning was so glad to see the big maples that she ran to each and hugged it, telling it how glad she was to see it again. Thought they, too, must have missed her, and been glad of her return.

F., 2. Used often to hug an old oak in the yard.

F., 18. When a child coming from play in the hot sun, would throw herself under the fine old tree in the yard and say, "you are a dear old tree for making it so cool here," and then jump up and give it an impetuous hug.

F., 6. When seen with her arms around a tree was told not to hurt it; said, "I was n't hurting it; I was only loving it because it had no friends to play with and talk to."

This emotional expression, which is so genuine and unrestrained in childhood, assumes that the tree has the same feelings as the child is expressing toward it, and shows this side of the companionship to be as close as that in the realm of intellect and will. This thought, which the child carries through consistently, that nature is instinct with life and intelligence, with emotions and volitions, is more inspiring, it would seem, than the later mechanical conception of inert matter. Not that the child-consciousness need be a copy of the primitive mind, in which animistic conceptions were usually connected with many revolting ceremonies. These were not the result of animism. *It* accompanies undeveloped intellect; the grossness of the savage customs were the result of undeveloped morals. But intelligence and morality do not vary in direct ratio. A commendation of the results of an animistic conception of nature, therefore, does not involve an approval of the social life of savagery. Conditions are widely different for the child and for the early races of men, and not the least of these differences is that the child has leaders who can correct any tendencies to vice.

The assumption that practically all children believe trees to possess a psychic life similar to their own, may be questioned on the ground that only those who had such beliefs would reply to the questions circulated. But in point of fact teachers usually sent returns from all the members of their classes, regardless of the children's attitude toward the questions. Teachers, too, who have not sent individual returns report that of large classes of young children, every one thinks trees

to be "alive and able to feel and talk and love." Evidence is unquestioned, also, that such ideas have never been suggested to them. In homes, and indeed in whole neighborhoods, where the parents' lives, knowing little but daily drudgery, are hard and unpoetic in the last degree, the children have the same attitude toward the trees and flowers as in cultured homes, though the expression of such feeling would be met with but little encouragement. Under such conditions these feelings are more quickly smothered than though they could breathe an atmosphere of refinement and poetic appreciation.

The wide interests opened up to childhood by giving trees and flowers psychic life, and the depth and range of sympathy thus made not only possible but actual, as these returns show, place within reach of teacher and parent immense possibilities, in the line of the child's social and moral development; and an education which crowds out such feelings, or allows them to atrophy from disuse, is to be seriously questioned.

The influence of a great expanse of wood is distinct and peculiar. The feeling is described as one of awe, reverence, solemnity, and often a sense of peace. Children speak in hushed tones, walk as softly as possible, and even unconsciously restrain their breathing. The feeling of reverence is shown by such replies as:

M., 19. Ever since childhood entering a forest had a soothing influence. The denser the forest the more satisfied was he.

F., 17. Hushed and awed, and felt the peace that seemed to abide there. When in a deep forest feels as if she were a little thing in a great big world.

F., 6. Coming to deep woods dropped voice to a whisper, though previously talking quite loudly; when asked why, said "It feels like church."

F., 17. "A sweet sadness in forests that turned my thoughts toward God. Felt that I must be good there."

M., 4. When taken to park, after looking around at the trees and flowers asked if they might not sing "God is love."

In open fields the feeling is quite the opposite — one of exultant freedom. There is no restraint on feeling, and its expression is often the most boisterous. Children and even older boys and girls say they never felt so free as when in the fields; they like to run and tumble on the grass with perfect abandon, are always free to laugh and talk as much as they please, nothing is too loud there; even severe and dignified old men romp like little boys.

In fine gardens children enjoy the sight of the flowers, but have an "unfree" feeling. This, however, is chiefly the result of prohibitions regarding the flowers, and has not at all the same cause as the feelings inspired by the forest. The restraint

of the garden is artificial and the result of training, that of the forest is natural and the result of an instinct which grew up through many generations of forest life. We have sometimes been told that the impressive solemnity of the forest, which is illustrated by the children's feelings here recorded, was the cause of the ancients peopling the trees with spirits. But does not such an explanation begin at the wrong end? What is the cause of the solemnity? Why should the trees, merely as natural objects, cause such an awe? They may be beautiful and stately, they may be useful for shelter or shade, but a contemplation of them from these points of view would awaken no feelings of reverence. Nor would silence alone, nor the subdued light of the forest, bring the feelings of worship that are inspired at such a time. Darkness and quietude may cause fear but not reverence. At least after they have been allowed their full influence, there is still a residuum. If, then, external circumstances do not fully explain the feeling, the cause, or a part of it, must be elsewhere sought. We already have the clue. If the individual is recapitulating the history of the race, and if the race has passed through a very long period in which trees were worshipped and regarded as protecting spirits, then it is quite natural that there should linger, in the child, traces of a similar attitude toward the trees. Instead, therefore, of the forest being peopled with gods because of its mysterious impressiveness, it is mysteriously impressive because of having been formerly peopled by the gods, in the imagination of primitive man. Through the period of a few thousand generations during which the surest means of safety from enemies was flight into the trees, there would gradually grow up in the race an instinctive feeling toward the trees as natural protectors. Is not this feeling of *dependence* the very essence of religion?—or at least the origin of it, for we may not choose to call it religion until it takes a more definite shape as *trust in a being*, or beings, who are believed to be powerful. Even as low down in the mental scale as the apes there doubtless is this feeling of safety, and an association of it with the tree; and, certainly, less developed intellect than the lowest races of mankind now possess would be sufficient for the harboring of thoughts toward the trees as beings strong enough to protect against enemies, and consequently sufficient for the beginnings of the same trust and humility which constitute the truest reverence in the highest races of to-day's civilization. Such an instinct, growing stronger for many centuries, and still in vigorous life among primitive tree-worshipping peoples, would of course show strong traces of survival, even in the most advanced races, and as a matter of fact the forest still has its influence over us in adult days.

If the tree-worshipping period was preceded, as already suggested in the section on tree-spirits, by a time in which even the beginnings of reverence were not possible,—a mere animal stage of development in which fear was the dominant emotion, and the forest was looked upon as only a place where wild beasts lurked,—we ought to find ontogenetic evidence of this. And many of the younger children do speak only of a feeling of fear, even when they are accompanied by their elders and the woods are known to harbor no wild animals. This feeling of fear decreases with age, as that of reverence grows—suggesting again that the race did pass through such stages in its religious evolution, though, of course, the reverence in its purest form still contains elements of fear.

The religious feeling here shown is not to be disregarded by the teacher. Children all too soon, in our present society, reach the persistently self-conscious stage, and this develops into our chronically homocentric attitude. If we believe this to be too narrow, here is our opportunity to broaden it. The feeling of reverence takes us out of self toward the infinite, and this *greatens* life. Littlenesses are left behind ; there is no room here for sham. Whatever may be our particular beliefs the elements of religious feeling are the same, and they are present in such experiences, and give all subsequent life a greater meaning.

In addition to having particular trees to which they are devoted, and which frequently have a very special associational value, children usually have a favorite species of tree. The maple, pine and oak, are regarded with the greatest favor. The reasons for choices are various : some of them æsthetic, some practical, others purely animistic. Calling tallness, stateliness, gracefulness, evergreenness, beauty of leaves, rich coloring, etc., æsthetic qualities ; making shade and fruit practical considerations ; and classing all implied personifications—the bold strength of the oak, the tender sympathy of the pine, the sweet pathos of the willow—as animistic ; we should probably find that æsthetic considerations lead, in the determination of favorite trees. The animistic conceptions, however, are more fundamental, and of wider range, even if not so frequently advanced as a reason for favoritism. Young children, moreover, are not able to analyze their likes and dislikes, and too much dependence is not to be placed in their replies on this point. Even if what they say can be accepted, what they leave unsaid cannot be determined. The young children, for instance, more frequently speak of the beauty or prettiness of the trees, while the older ones oftener mention the stateliness. We cannot conclude that therefore the young children have no

feeling of sublimity. The expression of it might be quite beyond their power. With them the practical considerations are most easily expressed, and very frequently a tree is disliked because it bears no fruit. Boys sometimes dislike the pine-tree's "whine" and the "crying" of the willow. They are not so animistic and full of sentiment as the girls. There is probably in this a suggestion that the female mind, like the body, is more of a race-type than the male. It is true, also, that the boys' surroundings and work are likely to be more sternly practical than the girls'.

The frequent emotional characteristics attributed to trees, in cases where such attributes could hardly have been learned from an older person, suggest the appropriateness of plant language, and remind us of the universal use by man of "flowers for their charactery." Much of the symbolism of trees and flowers has a natural relation to some quality of the tree or flower—as the drooping willow expressing mourning, the clinging ivy as an emblem of fidelity, the trembling aspen as a type of fear, the whiteness of the lily suggesting purity. Not unfrequently, however, without any natural connection, some incident forms an association which is never lost; as in the case of the juniper representing protection, from Elijah's having been sheltered by it in his flight from Ahab; the sycamore denoting curiosity since the time of Zacchæus; the olive as an emblem of peace, having been given to Judith when she restored peace to the Israelites, or possibly because of its connection with the oak; the linden denoting conjugal love, through its association with Philemon and Baucis; the rose as the universal symbol of love, connected with the story of Venus and Adonis. Sometimes a symbolic meaning is attached to a flower through a mere accident of language, as pansies, from the French *pensées*, thoughts.

The oak is about the only tree which is disliked by no one, so far as the children's verdict goes. It is admired for the beauty of its leaves, for its boldness, strength and noble bearing. The child's feelings may contain the suggestion of a reason why the oak, of all trees, held the most sacred place in earlier civilizations. It would be regarded as the most powerful spirit, with no unpleasant characteristics to detract from the feelings of reverence which it inspired.

The moral effect of the trees is worth emphasizing once more. Ruskin puts it strongly: "No one can be far wrong in either temper of mind or way of life who loves the trees enough," and Longfellow says

> "The silent majesty of these deep woods . . . .
> Shall uplift thy thoughts from earth;
> As to the sunshine and the pure, bright air
> Their tops the green trees lift."

IX.

The Tree in Poetry.

The personification of nature, so common and even so essential in poetry, is only a modernized form of animism, with some of the literalness removed from the meaning of the language. A century ago, when the relation between man and nature was less intimate than now, the nature-literature was artificial and lacked genuineness. The present poetic feeling of being "with nature's heart in tune," is well illustrated in Thoreau's companionship with her: "Every little pine needle expanded and swelled with sympathy, and befriended me. I was so distinctly made aware of the presence of something kindred to me, even in scenes which we are accustomed to call wild and dreary, and also that the nearest of blood to me, and humanest, was not a person nor a villager, that I thought no place could ever be strange to me again. . . . . Why should I be lonely? Is not our planet in the Milky Way?"[1] Here is the beginning of that feeling of oneness with the universe which is in the very essence of great poetry. The influence of this feeling is none the less real because it cannot be expressed and only vaguely suggested. It is, in fact, because of the depth of this feeling that expression fails.

> "There is a pleasure in the pathless woods,
> There is a rapture on the lonely shore . . . .
> To mingle with the universe and feel
> What I can ne'er express, yet cannot all conceal."[2]

"Man is a part of creation and finds his own moral harmony in that of the universe. One must feel either love or religion in order to appreciate nature."[3]

> "I have felt
> A presence that disturbs me with the joy
> Of elevated thoughts. . . . . Therefore am I still
> A lover of the meadows and the woods
> And mountains; . . . . well pleased to recognize
> In nature and the language of the sense
> The anchor of my purest thoughts, the nurse,
> The guide, the guardian of my heart, and soul
> Of all my moral being."[4]

This feeling of affinity with nature has often taken definite shape in the metaphysical thought that if the smallest part of nature could be fully understood it would furnish a key to the secret of the universe:

> "To see a world in a grain of sand
> And a heaven in a wild flower."[5]

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[1] *Walden*, London, 1886, pp. 130-1.
[2] Byron. [3] Madame de Staël. [4] Wordsworth. [5] Blake.

"Little flower—if I could understand
What you are, root and all, and all in all,
I should know what God and man is."[1]

The vague longing after the infinite, which the presence and companionship of nature brings to the heart, becomes a striving upward, a spiritual aspiration away from the narrowness of the actual. Even if we did not need the trees to warm our bodies, we should need them to warm our souls, says Dr. Bauer.

"Welcome, ye shades! Ye bowery thickets, hail!
Ye lofty pines! ye venerable oaks!
Ye ashes wild! resounding o'er the steep;
Delicious is your shelter to the soul."[2]

"Go forth under the open sky, and list
To nature's teachings."[3]

"There is a serene and settled majesty in woodland scenery, that enters into the soul, and delights and elevates it, and fills it with noble inclinations."[4]

"The tremendous unity of the pine absorbs and moulds the life of a race. . . . Whatever elements of imagination, or of warrior strength, or of domestic justice, were brought down by the Norwegian and the Goth against the dissoluteness or degradation of the south of Europe, were taught them under the green roofs and wild penetralia of the pine."[5]

To the Christian poet the upward leading of nature is a leading toward God:

"The meanest floweret of the vale,
The simplest note that swells the gale,
The common sun, the air, the skies,
To him are opening Paradise."[6]

"There is a lesson in each flower,
A story in each tree and bower;
In every herb on which we tread
Are written words, which, rightly read,
Will lead us from earth's fragrant sod
To hope, and holiness, and God."[7]

"There lives and works
A soul in all things, and that soul is God. . . .
Nature is but a name for an effect,
Whose cause is God. . . . not a flower,
But shows some touch in freckle, streak or stain
Of His unrivalled pencil."[8]

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[1] Tennyson.
[2] Thomson.
[3] Bryant.
[4] Irving.
[5] Ruskin.
[6] Gray.
[7] Cunningham.
[8] Cowper.

As a result of this nearness to the heart of nature there comes a soothing from care, a rest from the dust and the heat of the common-place day, an elevation of soul above trivialities, a noble purity born of great thoughts: "Children need, in their innocent up-springing, to have room to get away from the garish sun, and rest, as upon a mother's bosom, in the twilight silence of the growing woods."

> "There is a quiet spirit in these woods
> That dwells where'er the gentle south wind blows."[1]

"As the leaves of the trees are said to absorb all noxious qualities of the air and to breathe forth a purer atmosphere, so it seems to me as if they drew from us all sordid and angry passions and breathed forth peace and philanthropy. There is something nobly simple and pure in a taste for the cultivation of forest trees. It argues a sweet and generous nature."[2]

"The presence of the love of nature is an invariable sign of goodness of heart and justness of moral perception; wherever the feeling exists it acts for good on the character to which it belongs."[3]

"The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character by enfeebling the emotional part of our nature."[4]

These quotations are selected merely to illustrate, in a general way, the poets' feelings toward nature. The prose selections are poetic in spirit if not in form. The thesis is, that the poets, like the children, live close to nature and take her seriously, as a companion, capable of giving and receiving sympathy. This grows into the larger spirit of companionship with the universe, which calls forth the highest in the soul and gives a sense of harmony which is the deepest religious feeling and which produces a restfulness that is, or is akin to, the "peace of God, which passeth all understanding." It has already been suggested that the reason of this close relation between nature and spirit is to be found far back in primitive times when trees were worshipped as powerful and protecting spirits.

It remains to express my obligations to President Hall for the suggestion of this problem, for the use of the children's replies previously collected, and for much sympathy and encouragement throughout. To other members of the Clark Faculty also I am indebted for valuable references to literature.

[1] Longfellow.
[2] Irving.
[3] Ruskin.
[4] Darwin.

THE DYNAMOGENIC FACTORS IN PACEMAKING AND COMPETITION.

By NORMAN TRIPLETT, Indiana University.

This paper gives some facts resulting from a study in dynamogenic stimulation carried on in the Psychological Laboratory of Indiana University and their application to explain the subject of Pacemaking and Competition.

The work has been done under the direction of Dr. W. L. Bryan and Dr. J. A. Bergstrom, to both of whom I am greatly indebted for the help rendered throughout its progress.

A copy of the official bicycle records made up to the close of the season of 1897 was obtained from the Racing Board of the League of American Wheelmen, and from these records certain facts are given, which, with the help of the chart showing the times made for certain distances by professionals in the three kinds of races principally dealt with, will make clearer the discussion following. The lower curve of the chart represents the record for the distances given in the unpaced efforts against time. The middle curve the paced race against time, and the upper curve the best time made in competition races with pacemaker.

The definition of these races may be given as follows: The unpaced race against time is an effort by a single individual to lower the established record. No pacemaker is used; the only stimulation of the rider being the idea of reducing his own or some other man's former time. The paced race against time is also a single effort to make a record. It differs only in the fact that a swift multicycle, such as a tandem or "quod" "makes the pace" for the rider. If he has well trained pacers and is skillful in changing crews as they come on, so as to avoid losing speed, the paced man may reduce the mark for the distance ridden. The two kinds of efforts described are not really races but are called so for convenience. Both are run with a flying start.

The third or paced competition race is a real race. Here, besides keeping up with the pacemaker, is the added element of beating the other contestants. No records are given for the unpaced competition race. This race will, however, be referred to in the course of this paper. It is often called a "loafing" race from the fact that the riders hang back and

try to make pacemakers of each other, well knowing that a contestant starting out to make the pace can not win.

Value to be Given These Records.

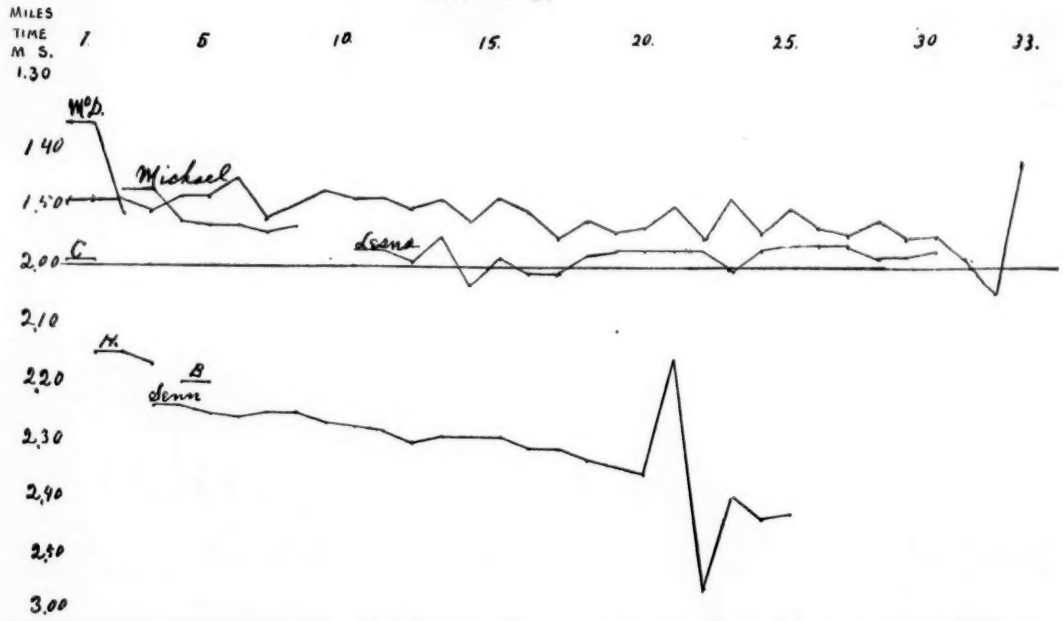
In presenting these records it is with the feeling that they have almost the force of a scientific experiment. There are, it is computed, over 2,000 racing wheelmen, all ambitious to make records. The figures as they stand to-day have been evolved from numberless contests, a few men making records which soon fall to some of the host who are pressing closely behind. Reductions now made, however, are in general small in amount. Were all the men engaged in racing to make an effort to reduce the time in the kinds of races named, it is probable that the records already made would stand or be but very little reduced while the present leaders and their closest competitors would again assert their superiority, each in his own style of race. Regarding the faster time of the paced races, as derived from the records, it may be asked whether the difference is due to pacing or to the kind of men who take part; and whether the argument ascribing the difference noted to pacing or competition should have less validity from the fact that different men hold the records in the different races. Men fast at one kind of racing are found to be comparatively slow at another. It is for this reason, perhaps, that Michael refuses to meet any one in an unpaced contest. The racer finds by experience that race in which he is best fitted to excel and specializes in that. The difference in time, therefore, between the paced and unpaced race, as shown by the records, is a measure of the difference between the experts in the two classes of racers. It seems probable that the same amount of difference exists relatively between the averages of the classes they represent. A striking practical proof that the difference between the paced and unpaced trials noted in the records is due to pacing, is found in the paced and unpaced time of some individual racers, given later, in which the difference in time corresponds closely to that of the records. The fact may be mentioned, too, that wheelmen themselves generally regard the value of a pace to be from 20 to 30 seconds in the mile.

Discussion of Records.

Since the records of unpaced efforts against time, shown on the lower curve of the chart, are given only to 25 miles, comparisons with the other races are made for the same distance.

As is readily seen the time made here is much slower than in the paced race against time. The various factors advanced

CHART I.



Lower curve, unpaced—against time. Middle curve, paced—against time. Upper curve, paced competition race.

in explanation are given in detail in the following pages but the fact itself deserves attention at this point.

It has been stated that the value of a pace is believed by racing men to be worth to the racer from 20 to 30 seconds in the mile, depending on the individual. The difference between the paced and unpaced race against time is, it is seen from these figures, somewhat greater.

	Average time per mile.		Gain over unpaced.	Gain per cent. over unpaced.	Gain per cent. competition over paced.
	Min.	Sec.	Sec.		
25 miles unpaced against time,	2	29.9			
" " paced " "	1	55.5	34.4	22.9	
" " paced competition,	1	50.35	39.55	26.4	3.5

The paced record from the 3rd to the 10th mile inclusive, is held by Michael. His average gain per mile over Senn, the unpaced champion, is 34 seconds. From the 11th mile upward, a different man, Lesna, holds the paced records. Evidently the pace is not worth so much to him for his average gain per mile is only 29.7 seconds, and a portion of this apparent gain is really due to the increasing exhaustion of the unpaced man, Senn.

That the ability to follow a pace varies with the individual is well known. As a rule the rider who is fast with a pace is slow without it,—and the converse is believed to be true. This is the reason why the same man can never hold records in both paced and unpaced races. Walter Sanger is one of the fastest unpaced riders on the track, but he can ride only a few seconds better with the very best pacemakers, while Michael, whose ability as a "waiter" is almost marvellous, would fall a comparatively easy victim, his rivals think, in an unpaced race. Success in paced racing presupposes a well trained force of pacers. The last named rider has confessedly enjoyed greater advantages than his competitors in this respect.

The regularity with which he rides is seen in his paced record from 3 to 10 miles. His average rate for these 8 miles was 1 min. 53 sec. with a mean variation of less than .8 second. Other evidences of the constancy of the gain from a pace may be seen through all the records, the time for

20	miles	professional, unpaced	is		49	min.	20 sec.
25	"	" paced	"		49	"	8.4 "
20	"	amateur, unpaced	"		52	"	17 "
25	"	" paced	"		51	"	57.2 "
80	"	professional, unpaced	"	3 hr.	54	"	53 "
100	"	" paced	"	3 "	52	"	14 "

Showing in these cases a gain in favor of the pace of practically 25%. However, ratios between records made by different men, even though they are the product of many riders and entitled to great consideration, have not the absolute certainty

that the paced and unpaced time of the same man would have. Data on this point is difficult to obtain, however, as trackmen seldom follow both kinds of racing but specialize in that for which they are best fitted. The best times for one mile of two prominent racers who are good at both games have, however, been secured and are here given.

Arthur Gardiner, one mile,	unpaced,	2 min.	3.8	sec.
" " " "	paced by 2 quods,	1 "	39.6	"
Earle Kiser, " "	unpaced,	2 "	10	"
" " " "	paced,	1 "	42	"

The gain, in the case of the first, of the paced over the unpaced, is 24.2 seconds, nearly 20 per cent. The second gains 28 seconds, nearly 22 per cent., or within nine-tenths of one per cent. of the difference between the official paced and unpaced records made by different men.

Dr. E. B. Turner, F. R. C. S., England, in 1889, began a scientific study of the Physiology of Pacing and Waiting races, lasting over three years. He was a racing man himself and in his investigations made many tests on himself and others. Some figures showing the difference in time made by him at different distances, paced and unpaced, are given. In comparing them with the records of to-day it must be remembered that the wheel then used was heavy and fitted with cushion tires so that the time made in trials is slow as compared with the time made with the modern pneumatic wheel, and in consequence the value of the pace expressed in per cent., appears small. It is seen that as between distances paced and unpaced, his average gain per mile for the different trials varies all the way from 11.8 seconds to 20 seconds.

The upper curve of the chart shows the records made in paced competition races. Here, besides beating the record, the racer is intent on defeating his rivals. This race is started from the tape and in consequence is slightly slower for the first two or three miles than the time in the paced race against time with flying start. Thereafter the better time made witnesses to the power and lasting effect of the competitive stimulus. For 25 miles the time in this race averages 5.15 seconds per mile, or 3.5 per cent. faster than the paced race against time. From the 3rd to the 10th mile the same man, Michael,[1] holds the record in both races. His time in the competition miles averages over 5 seconds faster than his

1 Since this article was written Michael's time in paced competition racing has been lowered. On June 17, 1898, E. A. McDuffie in his race with Taylor broke all records up to 30 miles. His time was 55:09 1-5, which is 1 min. 23 4-5 seconds faster than Michael's time for that distance. This increases the gain over the paced race against time to 8 seconds per mile.

Distance in Miles.	Details of Pacing.	Time.		Gains for paced over unpaced trial.		Average gain per mile.	Per cent. gain.	
		Min.	Sec.	Min.	Sec.	Sec.		
1	4 Pacemakers	2	37.6					
1	No "	2	49.4		11.8	11.8	7.	
3	5 "	8	6.6					
3	No "	8	57.8		51.2	17.	9.5	
3	No "	9	7.	1	.4	20.	11.7	
4	1 tandem "	11	31.					
4	No "	12	2.4		.53	13.25	7.33	
5	Several "	14	5.8					
5	" "	13	50.4					
5	No "	15	23.8	1	.18	15.6	8.4	
5	No "	15	37.2	1	31.4	18.25	9.8	
5	Alt. laps "	16	38.4	2	32.6	30.5	15.3	
10	Several "	31	18.4					With tricycle.
10	No "	33	17.2	1	58.8	11.8	6.	
25	Numerous "	71	15.8					
25	Shared "	85	21.8	14	6.	36.	16.5	
25	" "	81	16.4	10	.6	24.		

paced miles against time. The fact that the same racing crews were used in both races suggests that in the latter race they also were responsive to the competition stimulus.

In his treatise on the "Physiology of Waiting and Pacemaking in Speed Competitions," Dr. Turner asserts that the causes operating to produce the differences noted between paced and unpaced races are directly due to the physiological effects of bodily and mental exercise. Stated briefly: the man who in a given distance does the greater amount of muscular work burns up the greater amount of tissue and in consequence his blood is more loaded with waste products and he excretes more urea and uric acid than the man who does a less amount in the same time. This excretion of nitrogenous products as shown by his experiments is directly proportional to the amount of work done. The blood, surcharged with the poisonous matter, benumbs the brain and diminishes its power to direct and stimulate the muscles, and the muscles themselves, bathed by the impure blood, lose largely their contractile power. He asserts further, that phosphoric acid is the principal product of brain work, and that carbonic acid, lactic acid and uric acid are excreted in greater quantities during brain work. Therefore, the man racing under conditions to produce brain worry will be most severely distressed.

The production of phosphoric acid by brain work is, however, in dispute. Some observers have found the phosphates diminished, whilst others have found them present in larger quantities during intellectual labor. As James says it is a hard problem from the fact that the only gauge of the amount is that obtained in excretions which represent other organs as well as the brain. Dr. Turner's tables of results bear him out, however, in the assertion that a less amount of waste matter was excreted on days when little or no exercise was taken, a greater amount when pacers were used, and the greatest amount when he made his own pace.

Basing his position on these physiological facts he states his thesis thus: "Given two men of equal calibre, properly trained and racing on a fair course, it is impossible (bar falls and similar accidents) for one of them to lead, make fast running and win the race; and the easier the track, the lighter and better the machines ridden, and the faster the time of the race—the longer the distance by which the one following will win." This is known by every rider and accounts for the "loafing" in unpaced competition races, as no man, unless decidedly superior to his competitors, dares to set the pace.

Theories Accounting for the Faster Time of Paced and Competition Races.

Of the seven or eight not wholly distinct theories which have been advanced to account for the faster time made in paced as compared with unpaced competitive races and paced races against time as against unpaced races against time, a number need only be stated very briefly. They are grouped according to their nature and first are given two mechanical theories.

Suction Theory.

Those holding to this as the explanation assert that the vacuum left behind the pacing machine draws the rider following, along with it. Anderson's ride of a mile a minute at Roodhouse, Ill., with the locomotive as pacemaker, is the strongest argument in its favor. Those maintaining this theory believe that the racer paced by a tandem is at a disadvantage as compared with the racer paced by a quod or a larger machine, as the suction exerted is not so powerful.

The Shelter Theory.

This is closely related to the foregoing. Dr. Turner accepts it as a partial explanation of the aid to be gained from a pace, holding that the pacemaker or the leading competitor serves as a shelter from the wind, and that "a much greater amount of exertion, purely muscular, is required from a man to drive a machine when he is leading than when he is following, on account of the resistance of the air, and the greater the amount of wind blowing the greater the exertion, and conversely, the greater the shelter obtained the less the exertion."

This is the theory held, in general, by racers themselves. One of the champion riders of the country recently expressed this common view in a letter, as follows: "It is true that some very strong unpaced riders do not have any sort of success in paced racing. The only reason I can give for this is just simply that they have not studied the way to follow pace so as to be shielded from the wind. No matter which way it blows there is always a place where the man following pace can be out of the wind."

Encouragement Theory.

The presence of a friend on the pacing machine to encourage and keep up the spirits of the rider is claimed to be of great help. The mental disposition has been long known to be of importance in racing as in other cases where energy is expended. It is still as true as in Virgil's time that the winners "can because they think they can."

The Brain Worry Theory.

This theory shows why it is difficult for the leader in an unpaced competition race to win. For "a much greater amount of brain worry is incurred by making the pace than by waiting" (following). The man leading "is in a fidget the whole time whether he is going fast enough to exhaust his adversary; he is full of worry as to when that adversary means to commence his spurt; his nervous system is generally strung up, and at concert pitch, and his muscular and nervous efforts act and react on each other, producing an everincreasing exhaustion, which both dulls the impulse-giving power of the brain and the impulse-receiving or contractile power of the muscles."

Theory of Hypnotic Suggestions.

A curious theory, lately advanced, suggests the possibility that the strained attention given to the revolving wheel of the pacing machine in front produces a sort of hypnotism and that the accompanying muscular exaltation is the secret of the endurance shown by some long distance riders in paced races. Notice that Michael was able to make the last mile of his great 30 mile competition race the fastest of all and one of the fastest ever ridden.

The Automatic Theory.

This is also a factor which favors the waiting rider, and gives him a marked advantage. The leader, as has been noted, must use his brain to direct every movement of his muscles. As he becomes more distressed it requires a more intense exertion of will power to force his machine through the resisting air. On the other hand, the "waiter" rides automatically. He has nothing to do but hang on. "His brain having inaugurated the movement leaves it to the spinal cord to continue it and only resumes its functions when a change of direction or speed is necessary."—(Lagrange.) When he comes to the final spurt, his brain, assuming control again, imparts to the muscles a winning stimulus, while the continued brain work of the leader has brought great fatigue.

These facts seem to have a large foundation in truth. The lesser amount of fatigue incurred in paced trials is a matter of general knowledge. It is a common experience with wheelmen, and within that of the writer, that when following a lead on a long ride the feeling of automatic action becomes very pronounced, giving the sensation of a strong force pushing from behind. Of course the greater the distance ridden the more apparent becomes the saving in energy from automatic riding, as time is required to establish the movement. It may be remembered, in this connection, that while the average gain

of the paced over the unpaced record is 34.4 seconds, the difference between them for the first mile is only 23.8 seconds.

As between the pacer and the paced, every advantage seems to rest with the latter. The two mechanical factors of suction and shelter, so far as they are involved, assist the rider who follows. So the psychological theories, the stimulation from encouragement, the peculiar power induced by hypnotism, and the staying qualities of automatic action, if of help at all, directly benefit the paced rider. The element of disadvantage induced by brain action, on the contrary, belongs more especially to the rider who leads.

The Dynamogenic Factors.

The remaining factors to be discussed are those which the experiments on competition, detailed in the second part hereof, attempt to explain. No effort is made to weaken the force of the foregoing factors in accounting for the better time of paced races in comparison with unpaced races of the same type, but the facts of this study are given to throw whatever additional light they may.

This theory of competition holds that the bodily presence of another rider is a stimulus to the racer in arousing the competitive instinct; that another can thus be the means of releasing or freeing nervous energy for him that he cannot of himself release; and, further, that the sight of movement in that other by perhaps suggesting a higher rate of speed, is also an inspiration to greater effort. These are the factors that had their counterpart in the experimental study following; and it is along these lines that the facts determined are to find their interpretation.

Other Forms of Racing.

A few brief statements, mostly quoted from Dr. Turner's treatise, are given to show the value of a pacemaker in other forms of racing: "Foot racing differs from cycle racing in that it involves a much greater muscular effort. At each stride the whole body must be lifted and projected seven feet or more. The exertion is much the same whether the competitor makes his own pace or follows." So the "leader" and "waiter" commence their final spurt under more equal conditions than those which obtain in a cycle race, and a much smaller degree of superiority in the leading man enables him to run the spurt out of his opponent and win.

In ice skating the conditions are closely similar to those in wheel races, and a pacemaker is of nearly as much use as on the cycle track.

In a boat race the crews do not wait behind each other, but

struggle for the lead, and when they have obtained it "wait in front." The reasons for this are good:

(1) If a boat be clear in front it may take its opponent's water and wash it.

(2) The crew leading can see the others and regulate its pace accordingly.

(3) The actual physical labor involved in propelling a boat is very great, and therefore the laws of exercise already treated of apply.

(4) The length of a racing eight is 50 feet or more, and the time necessary to pass is too great to permit of waiting.

For similar reasons there is not the slightest advantage in waiting in a swimming race.

In horse racing a pacemaker is of use, but is not the overwhelming advantage it is in cycle racing. A good horse can run out an inferior, just as a good man can on foot; but in big races a stable companion is generally started to make running, when the favorite is a good stayer, in order that he may have a fast run race, without being put to the disadvantage of himself making the pace. This is especially true of distance races.

Kolb, from his study of the respiration and pulse curves resulting from a maximum effort in the various kinds of races, asserts that in cycling and skating, where great speed is attained by the use of special groups of muscles, it is the pulse rate that is largely increased, while in boat racing, running, wrestling and heavy gymnastics, the respiration is chiefly affected. If this claim is established it may furnish a reason why the pacemaker or competitor has greatest value in cycle and skating races. In these, where the ratio between power and speed is high, the outflow of nervous energy necessary in spurting has large expression. In the other class, while the energy made available by the competitive instinct, is probably the same, it is limited in its results by the respiratory need.

PART II.

From the laboratory competitions to be described, abstraction was made of nearly all the forces above outlined. In the 40 seconds the average trial lasted, no shelter from the wind was required, nor was any suction exerted, the only brain worry incident was that of maintaining a sufficiently high rate of speed to defeat the competitors. From the shortness of the time and nature of the case, generally, it is doubtful if any automatic movements could be established. On the other hand, the effort was intensely voluntary. It may be likened to the 100 yard dash — a sprint from beginning to end.

Description of Apparatus.

The apparatus for this study consisted of two fishing reels whose cranks turned in circles of one and three-fourths inches diameter. These were arranged on a Y shaped frame work clamped to the top of a heavy table, as shown in the cut. The sides of this frame work were spread sufficiently far apart to permit of two persons turning side by side. Bands of twisted silk cord ran over the well lacquered axes of the reels and were supported at C and D, two meters distant, by two small pulleys. The records were taken from the course A D. The other course B C being used merely for pacing or competition purposes. The wheel on the side from which the records were taken communicated the movement made to a recorder, the stylus of which traced a curve on the drum of a kymograph. The direction of this curve corresponded to the rate of turning, as the greater the speed the shorter and straighter the resulting line.

Method of Conducting the Experiment.

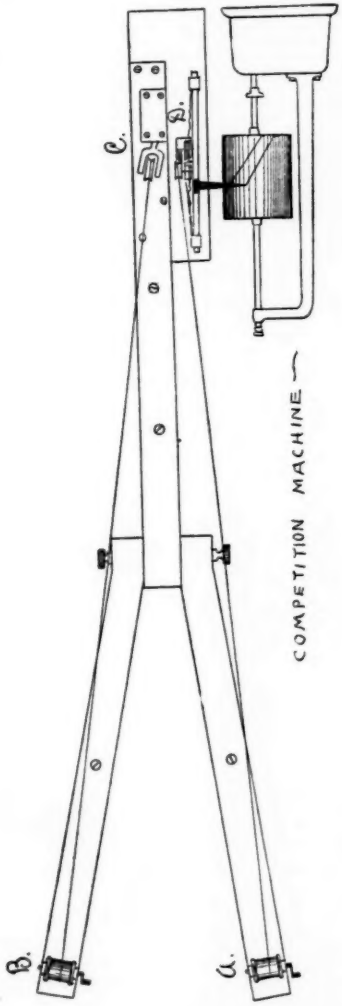
A subject taking the experiment was required to practice turning the reel until he had become accustomed to the machine. After a short period of rest the different trials were made with five-minute intervals between to obviate the possible effects of fatigue.

A trial consisted in turning the reel at the highest rate of speed until a small flag sewed to the silk band had made four circuits of the four-meter course. The time of the trial was taken by means of a stop-watch. The direction of the curves made on the drum likewise furnished graphic indications of the difference in time made between trials.

Limits of Error.

Frequent trials of the machinery showed very small errors. In each regular trial the flag travelled 16 meters. For ten test trials the average number of turns of the reel necessary to send it over this course was found to be 149.87, with a mean variation of .15, showing that the silk band did not slip to any appreciable extent. If 40 seconds be taken as the average time of a trial (which is not far wrong), .15 of a turn will be made in .04 second.

Care was also exercised to have the kymograph maintain, so far as possible, a uniform rate of turning. When fully wound up it would run for nearly three hours. The actual running time in taking the six trials of a subject was about 4 minutes, or 40 seconds per trial. In testing, the drum was rotated during 4 minutes. The time necessary to repeat this amount of rotation was found, by trials, to be 4 minutes and


C.
B.
A.
COMPETITION MACHINE

3 seconds, thus showing a retardation in each trial of about one-eightieth of the former trial as shown on the drum. The direct time of trials was taken with a stop-watch. It is from records thus taken that the tables given are composed. The drum curves, however, are important as giving a graphic representation of whatever changes occurred during the progress of the trial. The stylus, responding immediately to every change in rate of turning, gives clearly: indications of the force of competition, of the effects of adverse stimulation, fatigue, and other phenomena. The tendency of the retardation of the drum would be to diminish all these effects by one-eightieth—an amount not appreciable to the eye.

Statement of Results.

In the course of the work the records of nearly 225 persons of all ages were taken. However, all the tables given below, and all statements made, unless otherwise specified, are based on the records of 40 children taken in the following manner: After the usual preliminaries of practice, six trials were made by each of 20 subjects in this order: first a trial alone, followed by a trial in competition, then another alone, and thus alternating through the six efforts, giving three trials alone and three in competition. Six trials were taken by 20 other children of about the same age, the order of trials in this case being the first trial alone, second alone, third a competition trial, fourth alone, fifth a competition, and sixth alone.

By this scheme, a trial of either sort, after the first one, by either of the two groups, always corresponds to a different trial by the opposite group. Further, when the subjects of the two groups come to their fourth and sixth trials, an equal amount of practice has been gained by an equal number of trials of the same kind. This fact should be remembered in any observation of the time made in trials by any group.

During the taking of the records, and afterwards in working them over, it was seen that all cases would fall into two classes:

First. Those stimulated—

1 to make faster time in competition trials,

2 in such a way as to inhibit motion.

Second. The small number who seemed little affected by the race.

The three tables which follow are made up from the records of the 40 subjects mentioned. The classification was in general determined by the time record as taken by the watch.

The first table gives the records of 20 subjects who, on the whole, were stimulated positively. The second table contains 10 records of subjects who were overstimulated. The third table shows the time of 10 subjects who give slight evidence of being stimulated.

The probable error used in the tables is that for a single observation: $r = .6745 - \sqrt{\frac{\Sigma v^2}{n-1}}$. Its magnitude is large from the nature of the case. To ascertain how large this should properly be, the individual differences of the subjects of Group A in Table I were eliminated in the following manner: The average of the six trials made by each subject was taken as most fairly representing him. With this as a basis the six trials were reduced to percentages — thus doing away with peculiarities due to age and disposition. By this means the probable errors of this group for the six trials in order were 2.57, 1.43, 1.81, 2.24, 1.11, 1.55. A similar reduction should be made in the probable error of all the tables.

In the tables, A represents a trial alone, C a trial in competition.

TABLE I.

Subjects Stimulated Positively.

GROUP A.

	Age.	A.	C.	A.	C.	A.	C.
Violet F.	10	54.4	42.6	45.2	41.	42.	46.
Anna P.	9	67.	57.	55.4	50.4	49.	44.8
Willie H.	12	37.8	38.8	43.	39.	37.2	33.4
Bessie V.	11	46.2	41.	39.	30.2	33.6	32.4
Howard C.	11	42.	36.4	39.	41.	37.8	34.
Mary M.	11	48.	44.8	52.	44.6	43.8	40.
Lois P.	11	53.	45.6	44.	40.	40.6	35.8
Inez K.	13	37.	35.	35.8	34.	34.	32.6
Harvey L.	9	49.	42.6	39.6	37.6	36.	35.
Lora F.	11	40.4	35.	33.	35.	30.2	29.
Average	11	47.48	41.88	42.6	39.28	38.42	36.3
P. E.		6.18	4.45	4.68	3.83	3.74	3.74
Gains			5.6	.72	3.32	.86	2.12

GROUP B.

	Age.	A.	A.	C.	A.	C.	A.
Stephen M.	13	51.2	50.	43.	41.8	39.8	41.2*
Mary W.	13	56.	53.	45.8	49.4	45.	43.*
Bertha A.	10	56.2	49.	48.	46.8	41.4	44.4
Clara L.	8	52.	44.	46.	45.6	44.	45.2
Helen M.	10	45.	45.6	35.8	46.2	40.	40.
Gracie W.	12	56.6	50.	42.	39.	40.2	41.4
Dona R.	15	34.	37.2	36.	41.4	37.	32.8
Pearl C.	13	43.	43.	40.	40.6	33.8	35.
Clyde G.	13	36.	35.	32.4	33.	31.	35.
Lucile W.	10	52.	50.	43.	44.	38.2	40.2
Average	11.7	48.2	45.68	41.2	42.78	39.	39.82
P. E.		5.6	4.	3.42	3.17	2.89	2.84
Gains			2.52	4.48	1.58	3.78	.82

* Left-handed.

TABLE II.

Subjects Stimulated Adversely.

GROUP A.

	Age.	A.	C.	A.	C.	A.	C.
Jack R.	9	44.2	44.	41.8	48.	44.2	41.
Helen F.	9	44.	51.	43.8	44.	43.	41.2
Emma P.	11	38.4	42.	37.	39.6	36.6	32.
Warner J.	11	41.6	43.6	43.4	43.	40.	38.
Genevieve M.	12	36.	36.	32.6	32.8	31.2	34.8
Average	10.4	40.84	43.32	39.72	41.48	39.	37.4
P. E.		2.41	3.57	3.25	3.85	3.55	2.52

GROUP B.

	Age.	A.	A.	C.	A.	C.	A.
Hazel M.	11	38.	35.8	38.2	37.2	35.	42.
George B.	12	39.2	36.	37.6	34.2	36.	33.8
Mary B.	11	50.	46.	43.4	42.	48.	36.8
Carlisle B.	14	37.	35.4	35.	33.4	36.4	31.4
Eddie H.	11	31.2	29.2	27.6	27.	26.8	28.8
Average	11.8	39.08	36.48	36.36	34.76	34.4	34.56
P. E.		4.61	4.07	3.89	3.71	5.33	3.45

TABLE III.

Subjects little affected by competition.

GROUP A.

	Age.	A.	C.	A.	C.	A.	C.
Albert P.	13	29.	28.	27.	29.	27.	28.6
Milfred V.	17	36.4	29.	29.4	30.2	30.2	32.2
Harry V.	12	32.	32.	32.6	32.6	32.6	31.6
Robt. H.	12	31.4	31.4	32.2	35.4	35.	32.4
John T.	11	30.2	30.8	32.8	30.6	32.8	31.8
Average	13	31.8	30.24	30.8	31.56	31.5	31.3
P. E.		1.9	1.13	1.71	1.7	2.06	1.05

GROUP B.

	Age.	A.	A.	C.	A.	C.	A.
Lela T.	10	45.	37.4	36.8	36.	37.2	38.
Lura L.	11	42.	39.	38.	37.	37.	38.
Mollie A.	13	38.	30.	28.	30.	30.2	29.6
Anna F.	11	35.	31.8	32.4	30.	32.	30.4
Ora R.	14	37.2	30.	29.	27.8	28.4	26.8
Average	11.8	39.44	33.64	32.84	32.16	32.96	32.16
P. E.		3.11	2.88	3.03	2.75	2.69	3.71

The 20 subjects given in Group A and Group B, of Table I, in nearly all cases make marked reductions in the competition trials. The averages show large gains in these trials and small gains or even losses for the succeeding trials alone. The second trial for Group A is a competition, for Group B a trial alone. The gain between the first and second trials of the first group is 5.6 seconds, between the first and second trials of the second group, 2.52 seconds. The latter represents the practice effect—always greatest in the first trials, the former the element of competition plus the practice. The third trial in Group A—a trial alone—is .72 seconds slower than the preceding race trial. The third trial in Group B—a competition—is 4.48 seconds faster than the preceding trial alone. The fourth trials in these two groups are on an equality, as regards practice, from an equal number of trials of the same kind. In the first case the gain over the preceding trial is 3.32 seconds. In the latter there is a loss of 1.58 seconds from the time of the preceding competition trial. In like manner there is an equality of conditions in regard to the sixth trial of these groups, and again the effect of competition plainly appears, the competition trial gaining 2.12 seconds, and the trial alone losing .82 seconds with respect to the preceding trial. These are decided differences. Curve No. 1 in Chart II is a graphical representation of them.

The 10 subjects whose records are given in Table II are of interest. With them stimulation brought a loss of control. In one or more of the competition trials of each subject in this group the time is very much slower than that made in the preceding trial alone. Most frequently this is true of the first trial in competition, but with some was characteristic of every race. In all, 14 of the 25 races run by this group were equal or slower than the preceding trial alone. This seems to be brought about in large measure by the mental attitude of the subject. An intense desire to win, for instance, often resulting in over-stimulation. Accompanying phenomena were labored breathing, flushed faces and a stiffening or contraction of the muscles of the arm. A number of young children of from 5 to 9 years, not included in our group of 40, exhibited the phenomena most strikingly, the rigidity of the arm preventing free movement and in some cases resulting in an almost total inhibition of movement. The effort to continue turning in these cases was by a swaying of the whole body.

This seems a most interesting fact and confirmatory of the probable order of development of the muscles as given by Dr. Hall and others. In the case of those sufficiently developed to have the fast forearm movement, fatigue or overstimulation seemed to bring a recurrence to the whole arm and shoulder

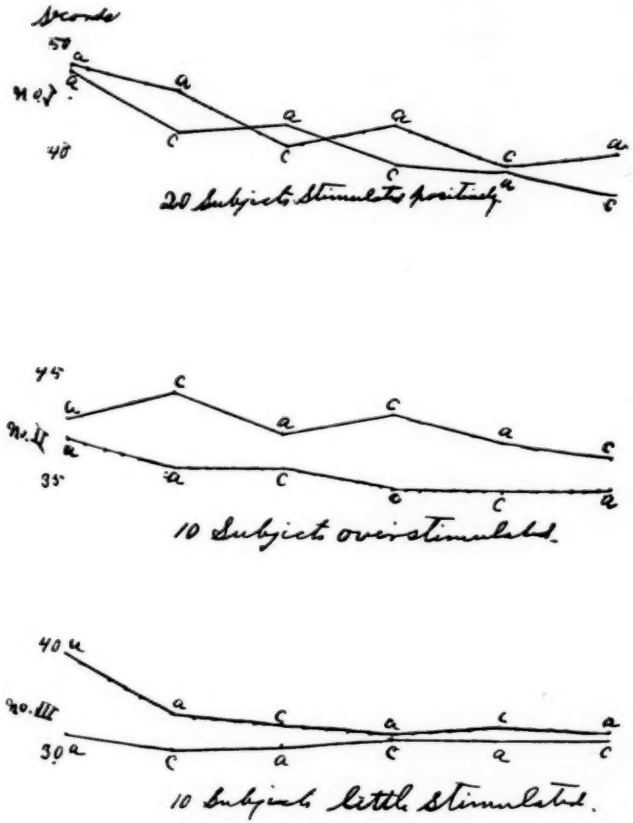


Chart II Solid line represents Group A.
Dotted " " " B.

movement of early childhood, and if the fatigue or excitement was sufficiently intense, to the whole body movement, while younger children easily fell into the swaying movement when affected by either of the causes named.

It reminds one of the way in which fatigue of a small muscle used in ergographic work, will cause the subject to attempt to draw on his larger muscles, or, of the man who moves to

the city and acquires the upright carriage and springing step of the city-bred man, who, when greatly fatigued, insensibly falls into the old "clodhopper" gait. This tendency to revert to earlier movements and also old manners of speech, as Höpfner has shown in his "Fatigue of School Children," is common, when, for any reason, the centers of control are interfered with. It may be said, therefore, that in the work under consideration the chief difference between this group and the large group in Table I, was a difference in control; the stimulation inhibiting the proper function of the motor centers in the one case, and reinforcing it in the other. This, at least, seemed apparent from the characteristics exhibited by the two classes. Observation of the subjects of this class under trial, and careful scrutiny of their graphic records, show how decided gains were sometimes lost by the subject "going to pieces" at the critical point of the race, not being able to endure the nervous strain. Yet there exists no sharp line of division between subjects stimulated to make faster time and those affected in the opposite way. In some instances the nervous excitement acted adversely in every race trial, while in others, a gain in control, enabled the subject to make a material reduction in the last competition. A. B., one of three adults affected adversely, is an athletic young man, a fine tennis and hand-ball player, and known to be stimulated in contests of these kinds. It was noticed that in his competition trials time was lost because of his attempt to take advantage of the larger muscles of the arm and shoulder. After many trials and injunctions to avoid the movement he gained sufficient control to enable him to reduce the time in the competitions.

A. V., an adult of nervous organization, went half through his race with a great gain over his trial alone, but seeing his antagonist pushing him closely, broke down and lost the most of the gain made in the first half. The time of the trial alone was 38.6 seconds, that of the competition was 37.2 seconds. A comparison of the time in which the halves of the trials were made was computed in the following way: On the ordinate of the graph is measured the distance the stylus travels across the drum during 150 turns of the reel—the number in a trial. The distance on the abscissa between the ordinates running through the ends of the curve of any trial gives the time of the trial.

Parallel abscissas were drawn at the extremities of the curves, and a third one-half way between them. Half of the turns made in a trial were thus on each side of this middle line, and the times in which these turns were made were proportional to the segments of this line made by the curve intersecting it. By this means it was found that A. V. made the first

75 turns in his competition trial in 15 seconds, the second half in 22.2 seconds. By the same means, each half of the preceding trial alone was 19.3 seconds—an exception to the rule that the last half is slower because of fatigue.

Other curves when worked out in this way gave similar results. The time record, therefore, it must be seen, is not always a true index to the amount of stimulation present. Had the trials consisted of but half as many turns the effect of competition as it appears in the tables would have been shown much more constantly. Table II would have been a smaller group if indeed any necessity existed for retaining it.

A comparison of the time made by the different groups shows that the subjects of Table I are much slower than those of Table II, and that a still greater difference exists between this group and the subjects found in Table III. It may be said that they are slower because of greater sluggishness of disposition, and that the reductions made are largely a result of the subjects warming up. This, indeed, may be a part of the cause for it, but as the larger reductions coincide with the competition trials this cannot be held to completely account for it. A glance over the individual records discovers some facts which furnish a plausible partial explanation, when taken in connection with the following fact. The age at which children acquire control of the wrist movements, a large factor in turning the reel with speed, was found to be about 11 years in general, although a few of 9 and 10 years had this power. Now, of the 20 subjects composing Table I, 7 are 10 years of age or younger, while two others, age 13, are left-handed and being compelled to use the right hand are slow in consequence. So, here are 9 subjects, a number nearly equal to the group in Table II or Table III, who had a reason for being slow. Were these omitted from the count, the time of the initial trial would be found not to vary materially from that of Table II.

Besides the lack of muscular development of the younger subjects mentioned above, many of the subjects of Table I seemed not to have proper ideals of speed. The desire to beat, if it did nothing else, brought them to a sense of what was possible for them. The arousal of their competitive instincts and the idea of a faster movement, perhaps, in the contestant, induced greater concentration of energy.

The subjects in Table III, are a small group who seemed very little affected by competition. They made very fast time, but they are older than the average; their muscular control was good, and they had the forearm movements. Practice gains while somewhat apparent at first in some cases, are, as shown by curve No. 3 of the chart, on the whole, less in amount.

Their drum records show fewer fluctuations and irregularities, and less pronounced fatigue curves at the end.

There sems to be a striking analogy between these subjects and those racing men who are fast without a pace, but can do little or no better in a paced or competition race.

Observations on the Work.

Energy Fluctuations. Among the many personal differences shown by the various subjects, nervous peculiarities were of great interest. A number exhibited the marked periodicity of energy discovered by Dr. Lombard, and described by him in the American Journal of Psychology. It was especially prominent in the cases of L. P. and H. F., both bright children of an exceedingly nervous temperament, a rapid period being succeeded by one of apparent fatigue, thus alternating to the end of the trial. It was noticeable both in trials alone and in competition. In both subjects the phenomenon became less marked in the course of the trials. Both were much affected by the stimulation. The first making gains in her races, the second, almost helpless from nervous agitation in her first competition, does better in the second, and succeeds in making a substantial reduction in her third race, although a large part of the gain made in the first half of the trial is lost in the second.

Kolb in his "Physiology of Sport" asserts that in every physical contest involving a maximum effort there will be fluctuations of energy, and says that all oarsmen are familiar with the "hills" in the boat race, one being encountered in the second minute, the other at the end of the sixth minute. Long distance runners also experience the ebb and flow of strength markedly.

Effects from Age. It seems probable that one who is amenable to the stimulation of competition in childhood will be susceptible during his whole life; like the race horse that retains his desire to run long after the ability is lacking. The age at which the instinct develops was not ascertained. Two boys of 5 years possessed it to a marked degree. The one defeated in their race, according to his mother, felt badly about it all day. Adult subjects displayed the same differences of stimulation as in the case of children. It might be inferred from the records taken that the effect is greatest in early life and diminishes with advancing years. The practice effect, however, is greatest among the young, as they do not have the skill in the use of the hand that comes later. With adults, owing to their greater muscular control, practice counts for much less. So it was that the latter more surely made reductions in their competition trials, but smaller ones.

People differ greatly, as was noted, in the degree in which they are stimulated, but for the same individual it seems to be a constant force.

Two girls who were trained till the gain from practice was a small matter, in a ten days' trial showed remarkable uniformity in making reductions in their race trials. From the shortness of the period, in these cases, half the usual number of turns, and the skill acquired, the reductions were, however, small in amount. The averages for the ten days are as follows:

	a	c	a	c	a	c
Bessie V.	15.8	14.9	15.3	14.65	15.3	14.55
Helen F.	18.45	17.75	18.52	17.22	18.02	16.77

Each subject had 30 competitions. Out of this number the time for the first subject was reduced in 24 or four-fifths of the entire number. It was equal to the preceding trial in two cases. The second was faster in her race trials in 25 of the 30 or five-sixths of all, and in two cases equalled the preceding record. Of the three remaining trials, the pain from a blister on the hand caused one to be made in slower time.

In the race trials of the 40 subjects a portion of the reduction when made might in some cases be attributed to encouraging remarks. For instance, the racer would be told to "keep on, you are ahead," or "just one more round," in order to steady him. In the extended trial of the two subjects under discussion, however, some preliminary words to arouse the desire to beat were used, but after the start not a word was spoken. Whatever effect appeared was purely that of competition.

Sex Differences.

Some small differences were found in the motor rate between the sexes, corresponding in general to the results exhibited in Dr. W. L. Bryan's study of "Motor Ability." For this grouping, the averages only for which are given, all cases were taken in which a trial alone was succeeded by a trial in competition.

At 10 years of age the boys begin faster than the girls, but both sexes are practically together on the competition trial. The greater speed of the boys, as Dr. Bryan has pointed out, is largely a result of their greater knack or skill in doing things, attributable to their more active life.

At 11 the boys are distinctly ahead, and, as noted before, a year's time has brought a large increase in speed, as at about this age a free use of the wrist movement is gained. At 12 the boys are slower than at 11, and have no advantage over the

With this table the mean variation was used.

TABLE IV.

Age.	MALES.			FEMALES		
	Cases.	A.	C.	Cases.	A.	C.
10	5	41.88 4.34	41.6 5.52	13	46.83 3.76	41.4 2.98
11	14	35.76 4.37	34.36 5.1	25	40.3 5.2	37.89 4.47
12	14	38.1 3.92	35.7 2.75	19	38.39 6.11	35.77 4.
13	7	34.1 7.13	32.94 4.81	15	39.65 5.3	36.24 5.1
Adults	45	31.35 3.17	29. 3.29	14	32.77 2.8	29.24 2.56

girls. A difference appears again at 13 in favor of the boys. In the case of adults a slight margin of difference on the side of the males is seen.

As to the amount of stimulation the odds are apparently with the female sex. The proportion of girls influenced by competition is greater. Of the 40 subjects, 14 or 36.6 per cent. were boys, 26 or 63.4 per cent. were girls. In the group of those who were susceptible and influenced positively were 28.6 per cent. of the boys and 61.5 per cent. of the girls. In the group influenced negatively were 35.7 per cent. of the boys and 19.2 per cent. of the girls, and in the group not influenced 35.7 per cent. of the boys and 19.2 per cent. of the girls were found. These figures are deduced from the grouping made on the basis of the time record. An inspection of the graphs indicates that six in Table III were somewhat stimulated, although it is not made evident from the watch record. Were these subjects, consisting of 5 girls and 1 boy, to be transferred to their proper table the result would show that 100 per cent. of the girls and 71 per cent. of the boys showed stimulation.

The gross amount of the effect of competition is also greater in girls. When they were stimulated and had control they made greater gains than the boys and when over-stimulated their losses were greater than those made by the boys. The 16 girls of Table I gained the average sum of 10 seconds in their competition trials, while the four boys of this group gained an average sum of 8.15 seconds. In Table II the 5 girls lost 3 seconds each, in the course of their competition trials, while the 5 boys lost less than 1 second each.

INFLUENCES AFFECTING THE TIME OF SUCCEEDING TRIALS ALONE.

It is a well-knwn fact, that some wheelmen, who in private practice can go very fast, fail to distinguish themselves when

the real race is run in the presence of the public. The weakening effect of nervous agitation has been ascribed as the cause. On the other hand, Manouvrier, in his dynamometric studies found that his subject increased the energy of his movement when spectators were present. This is a a common observation. The boy can turn better handsprings when wishing to impress the girls with a sense of his accomplishments. The football team play better ball under the stimulation of the home crowd. Other examples could be instanced showing how people respond to various social stimulations.

In the records of the 40 subjects found in the three groups discussed above, there are 80 cases wherein a competition trial is followed by a trial alone. Of these, 45 were made in faster time than the preceding competition trial. Several facts seem to contribute to this result.

First, greater facility in turning naturally follows from the practice gained in former trials. In general, spectators were not permitted during the trials alone, but in a few cases visitors were present. The effect of this would be to stimulate the subject in a trial alone. Then, too, the competition element entered into the trials alone and it was found advisable in some cases to keep from the subject the time made, as there was a constant desire to beat his own or his friend's records, and thus make all the trials competitive. The competition feeling seemed present all the time. It is felt, therefore, that succeeding trials alone are not really non-competitive trials.

In addition, the competition trial was a pattern for after trials, giving a higher ideal of speed and a hint of what was possible for the subject. Féré remarks that it was his own experience, and that of a majority of experimenters in dynamometrie, "that the second trial was in general stronger than the first, the first trial having the effect of reinforcing the idea of the movement." The same thing seems peculiarly true of the kind of work under discussion. The subject comes to a succeeding trial alone with a reinforced image of the movement. The over-excitement of the former race is gone, but somewhat of its stimulating effect, it may be, remains and in consequence more than half of the cases equal or exceed the former competitive trial.

PART III.

The Idea of Movement.

We are led to believe that in the laboratory competitions detailed in Part II of this article, besides the bodily presence of a competitor, the idea of his movement, whether gained from sight or sound, had a stimulating effect on the racer. Some subjects followed with the eyes the course of the flags during the race and directed their exertions accordingly. Others seemed to be spurred on by the sound of the other machine, gaining some idea of the speed from the noise it made. Either seemed to possess equal power as a stimulus.

A favorite psychological principle with Féré, whose "Sensation et Mouvement" describes the most important work done in the field of Dynamogeny, is that "the energy of a movement is in proportion to the idea of that movement." He gives an experiment illustrating the subject as follows:

"If we ask the subject to look attentively at the movements of flexion, which we make with our hand, at the end of a few minutes he declares that he has the sensation of the same movement being made in his own hand, even though it may be entirely unmoved. And soon, indeed, his hand begins irresistibly to execute rhythmic movements of flexion. Or, if instead of letting the experiment come to this point, the subject is stopped at the moment where he commences to have the sensation of movement, and a dynamometer is placed in his hand, it is shown that the energy of his effort is increased one-fourth to one-half." Before the experiment the normal dynamometric force of the right hand was 23 kg., of the left, 15 kg. After seeing the experimenter make 20 flexions, the pressure for the subject's right hand was 46 kg., or double the former record. The left hand showed a slightly diminished force. An attempt was made to verify Féré's work with the ergograph. The subject was required to make maximum finger lifts corresponding to the beats of a metronome. After a series of lifts, the signal was given by the operator raising the index finger as if with the effort of lifting. Of 12 subjects tried, 8 made an increase when taking the time from the finger. The amount of increase seemed to be in proportion to the attention bestowed on the lifted finger of the operator. Two, who noticeably gave little attention to the straining of the finger except as a mere signal for lifting, made no gain whatever. Five maximum lifts of E. J., immediately preceding the substitution of the finger movement, averaged 17.2 millimeters in height, with a mean variation of .6 m. m. The first five efforts made at the sight of the finger movement averaged 19.1 m. m., mean variation .7 m. m., a

gain of 11 per cent. P. M. G., toward the end of an exhaustion curve, of which the last five lifts averaged 7.2 m. m., made five lifts, taking the cue from the finger, of an average height of 11.4 m. m., after which the energy of his efforts again began to decrease.

Effect of a Higher Rate on Counting.

An experiment on vocalization was made wherein a higher rate was suggested to the subject.

Ten subjects took the work described below on six successive days. Each was required to count aloud from 1 to 20 and repeat, as rapidly as articulation permitted, for 5 seconds. Three trials were made. The operator now counted at a faster rate and asked the subject to follow that rate. Three trials of this kind were made. This may be called Programme A.

Programme B differed from this merely in the one particular that the operator did no counting, but the three preliminary trials alone were followed instead by three similar trials alone—the intervals between trials, however, remaining the same.

Five subjects began with Programme A and five with Programme B, alternating each day, so that in the course of the six days each person had three experiences with each programme. The average sum counted by each subject during the series of trials is given below. Dividing by nine will give the average number counted in a single trial of that kind.

Programme A.				Programme B.		
Cases.	No. alone.	After a higher rate is given.	Gain.	No. alone.	Alone. No rate given.	Gain.
10	288.4	307.6	19.2	287.	288.5	1.5

The difference between the averages of the first two columns, 19.2, is the average gain of the ten subjects after they have had given them the idea of a faster rate of counting. Under this programme each individual makes a gain, under the other, where no higher rate is given, seven make smaller gains, three lose, and the average gain is but 1.5.

The principle of ideomotor action has wide application in human life. In the cases cited the observance of motion in another became a stimulus to greater effort. It may, however, have the opposite effect. A correspondence of rhythm of movement seems necessary to make it of aid. Two boys jumping together, or one following immediately at the sight of the other's jump, will not cover the distance possible in

jumping alone, because the swaying of the body, and swinging of the arms, not being synchronous or rhythmic become a distraction. So one soon becomes fatigued when walking with a person out of step.

Concluding Statement.

From the above facts regarding the laboratory races we infer that the bodily presence of another contestant participating simultaneously in the race serves to liberate latent energy not ordinarily available. This inference is further justified by the difference in time between the paced competition races and the paced races against time, amounting to an average of 5.15 seconds per mile up to 25 miles. The factors of shelter from the wind, encouragement, brain worry, hypnotic suggestion, and automatic movement, are common to both, while the competitors participate simultaneously in person only in the first.

In the next place the sight of the movements of the pacemakers or leading competitors, and the idea of higher speed, furnished by this or some other means, are probably in themselves dynamogenic factors of some consequence.

DARWIN'S IDEA OF MENTAL DEVELOPMENT.

By MARION HAMILTON CARTER.

INTRODUCTION.

In surveying the rise and progress of the Idea of Evolution, particularly since the publication of Darwin's "Origin of Species," in 1859, one can but be struck with its increasingly wide application to the interpretation of phenomena in every field of human inquiry. Starting with organic forms it has spread over both the world of living matter and the world of dead. Nay, more, it is now made to cover the facts of consciousness, and to serve as an explanation of the peculiarities of mind as well as of those of structure. Existence has come to be regarded, not as a bare fact, but as a continuing process in which there are known or determinable conditions followed by known or determinable results.

That the general concept of Evolution had been widely entertained previous to Darwin's day is beyond dispute, but it is to Darwin that we owe the definite and concrete form in which it has become potent in many new fields of investigation.

Inseparably bound up with the idea of organic evolution is the idea of mental evolution. *That* mind evolves seems to have been self-evident to Darwin, the case being granted at once upon its merits, and nowhere do we find him questioning it; *how* mind evolves he devoted a not inconsiderable portion of his work to showing; but he seems to have rested his problem on that assumption, for he tells us that "I have nothing to do with the origin of the mental powers, any more than I have with life itself. We are concerned only with the diversities of instinct and of the other mental faculties of animals of the same class."[1] And again, with regard to sensation, he says, "How a nerve comes to be sensitive to light hardly concerns us more than how life itself originated."[2]

Darwin accepted mind, as he accepted life itself, as part and parcel of his scheme of organic evolution; and he thought widely, though not deeply, upon it. He was emphatically neither psychologist nor metaphysician, and writes somewhat naively to John Fiske, of the "Outlines of Cosmic Philosophy:" "I have long wished to know something about the views of the many great men whose doctrines you give. With

[1] *Origin of Species*, 6th ed., p. 242.
[2] *Ibid.*, p. 171.

the exception of special points I did not even understand H. Spencer's general doctrine. I never in my life read so lucid an expositor (and therefore thinker) as you are; and I think I understand nearly the whole — perhaps less clearly about Cosmic Theism and Causation than other parts. . . . . It pleased me to find that here and there I had arrived from my own crude thoughts at some of the same conclusions with you, though I could seldom or never give my reasons for such conclusions."[1]

It is not without some significance, particularly in an attempt to ascertain Darwin's exact philosophical standpoints, that this letter, mentioning special illumination, was not written until 1874, or eight years before his death, and after the great works of his life had been given to the world. His most mature thought upon psychological matters, or those bordering upon the psychological, is given to us in his work "On the Expression of the Emotions in Man and Animals." The earliest notes for this are dated 1838; the questionnaires from which he obtained much valuable information were sent out in 1867; but the book itself was not begun until Jan., 1871, the rough copy being finished in April of the same year.[2] It was published in 1873, *or one year before the Fiske letter!*

Final causes of things — ultimate realities — seem never to have troubled Darwin; doubtless they did not even come upon his horizon. On these subjects he held essentially the common sense views of the every-day man. He assumed out of hand that it was better to be an ape than an insect; that it was better to be a man than an ape; that it was better to be a white man than a Hottentot, and that it was better to be a civilized white man than a barbarian; and *progress* meant for him a movement in the direction of the civilized white man, with all that that entailed of intellectual and moral attainment, and not a movement in the direction of the insect. In the "Origin of Species" he writes:

"The degree of differentiation and specialization of the parts in organic beings, when arrived at maturity, is the best standard, as yet suggested, of their degree of perfection or highness. We have also seen that, as the specialization of parts is an advantage to each being, so natural selection will tend to render the organization of each being more specialized and perfect, and in this sense higher; not but that it may leave many creatures with simple and unimproved structures fitted for simple conditions of life, and in some cases will even degrade or simplify the organization, yet leaving such degraded beings better fitted for their new walks of life."[3]

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[1] *Life and Letters*, Vol. II, p. 371.
[2] *Ibid.*, Vol. II, p. 313.
[3] *Origin of Species*, p. 363.

His common sense view is again shown in his remarks on beauty.

"We can to a certain extent understand how it is that there is so much beauty throughout nature; for this may be largely attributed to the agency of selection. That beauty, according to our sense of it, is not universal, must be admitted by every one who will look at some venomous snakes, at some fishes, and at certain hideous bats with a distorted resemblance to the human face."[1]

When, in 1859, Huxley spoke of Darwin as in the "front rank of British philosophers,"[2] we are to understand the term as then used to mean what is now generally called man of science rather than metaphysician. Much of Darwin's philosophical reading and thinking was evidently done late in life, if we may judge from his letters and the books he especially refers to in his later works, many of which were not published until the sixties and seventies; yet a very large part of his work was distinctly philosophical, *i. e.*, dealt with ultimate causal relations of phenomena and their laws, and one, at least, of his books may justly be regarded as a contribution to psychology. The problem before us now—Darwin's Idea of Mental Development — is biological in only the widest sense of the term.

In order to determine what his philosophical creed was, to see the conclusions he reached concerning consciousness and its place in a world-plan, it will be, perhaps, necessary to sum up the important questions presented by an evolutional view of mind, and discover how far he had both formulated and answered them. They are as follows:

I. Does mind come into the causal series of organic evolution at large? Is it actively concerned in progress, *i. e.*, has it a "survival value?"

II. If Darwin answers this question affirmatively, how does he define "mind?"

III. What is the relation of body, and, more particularly, of brain to mind?

IV. What evolves in "mental evolution," — mind, body, or both mind and body? If mind only, how can it influence organic evolution? If body only, how does its evolution carry with it the evolution of mind? If both, what is the course of "mental evolution?"

To these questions I shall endeavor to find answers in Darwin's own words, or (where he has left us no definite statements as to his views) give what he appears to have tacitly assumed or understood.

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[1] *Origin of Species*, p. 488.
[2] T. H. Huxley: *Darwiniana; Essays*, 1894, p. 14.

CHAPTER I.

Does mind come into the causal series of organic evolution at large; is it actively concerned in progress, *i. e.*, has it a "survival value?"

To each clause of this question Darwin answers emphatically: "Yes." It is noteworthy, however, that he nowhere formulates, in definite terms, the problem of mind in the causal series of organic evolution, as distinct from the problems of mind's activity in progress and "survival value." What he had to say of mind in the one connection is inextricably interwoven with what he said of it in the others.

The story can be largely told in his own words, and is contained almost entirely in the "Descent of Man."

"Of the high importance of the intellectual faculties, there can be no doubt, for man mainly owes to them his predominant position in the world. We can see, that in the rudest state of society, the individuals who were the most sagacious, who invented and used the best weapons or traps, and who were best able to defend themselves, would rear the greatest number of offspring. The tribes which included the largest number of men thus endowed, would increase in number and supplant other tribes. Numbers depend primarily on the means of subsistence, and this depends partly on the physical nature of the country, but in a much higher degree on the arts which are there practised. . . . . All that we know about savages, or may infer from their traditions . . . . show that from remotest times successful tribes have supplanted other tribes, ... and they succeed mainly, though not exclusively, through their arts, which are products of the intellect. It is, therefore, highly probable that with mankind the intellectual faculties have been mainly and gradually perfected through natural selection. . . . . Now, if some one man in a tribe, more sagacious than the others, invented a new snare or weapon, or other means of attack or defence, the plainest self interest, without the assistance of much reasoning power, would prompt the other members to imitate him, and all would thus profit. . . . . If the new invention were an important one the tribe would increase in number, spread and supplant other tribes."[1]

"Man, in the rudest state in which he now exists, is the most dominant animal that has ever appeared on this earth. He has spread more widely than any other highly organized form; and all others have yielded before him. *He manifestly owes this immense superiority to his intellectual faculties*, to his social habits, which lead him to aid and defend his fellows, and to his corporal structure. *The supreme importance of these characters has been proved by the final arbitrament of the battle for life.* Through his powers of intellect, articulate language has been evolved; and on this his wonderful advancement has mainly depended. As Mr. Chauncey Wright remarks, 'a psychological analysis of the faculty of language shows, that even the smallest proficiency in it might require more brain

[1] *Descent*, new ed., pp. 128-9.

power than the greatest proficiency in any other direction.' He has invented and is able to use various weapons, tools, traps, etc., with which he defends himself, kills or catches prey, and otherwise obtains food. He has made rafts or canoes for fishing or crossing over to neighboring fertile islands. He has discovered the art of making fire, by which hard and stringy roots can be rendered digestible, and poisonous roots or herbs innocuous. This discovery of fire, probably the greatest ever made by man, excepting language, dates from before the dawn of history. These several inventions, by which man in the rudest state has become so pre-eminent, are the direct results of the development of his powers of observation, memory, curiosity, imagination and reason. I cannot therefore understand how it is that Mr. Wallace maintains, that 'natural selection could only have endowed the savage with a brain a little superior to that of an ape.' " [1]

" . . . . The intellect must have been all-important to him even at a very remote period, as enabling him to invent and use language, to make weapons, tools, traps, etc.,whereby with the aid of his social habits he long ago became the most dominant of all living creatures."[2] . . . . "But mere bodily strength and size would do little for victory, unless associated with courage, perseverance and determined energy."[3]

In a letter to Lyell we find these words: "I can see no difficulty in the most intellectual individuals of a species being continually selected; . . . . the less intellectual races being exterminated."[4]

And compare the following:

"Obscure as is the problem of the advance of civilization, we can at least see that a nation which produced during a lengthened period the greatest number of highly intellectual, energetic, brave, patriotic and benevolent men, would generally prevail over less favored nations."[5]

In another letter, also to Lyell, he answers a case which seems at first sight contrary to his theories, *i. e.*, the stagnation and retrogression of the Greeks after having very high intellectual attainments.

"Thinking over . . . . the high state of intellectual development of the old Grecians with little or no subsequent improvement, being an apparent difficulty, it has just occurred to me that in fact the case harmonizes perfectly with our views. . . . . For in a state of anarchy, or despotism, or bad government, or after irruption of barbarism, force, strength or ferocity and not intellect would be apt to gain the day."[6]

In the passage which follows, Darwin carries to its logical conclusion his view of the importance of mind to progress.

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[1] *Descent*, pp. 48-49. Italics mine.
[2] *Ibid.*, pp. 609-10.
[3] *Ibid.*, p. 564.
[4] *Life and Letters*, Vol. II, p. 7.
[5] *Descent*, p. 142.
[6] *Life and Letters*, Vol. II, pp. 88-9.

Not only does the individual mind serve the individual man in the struggle for existence, but the collective mind in a community is a necessity for common progress. He writes:

"The presence of a body of well instructed men, who have not to labor for their daily bread, is important to a degree which cannot be overestimated; as all high intellectual work is carried on by them, and on such work material progress of all kinds mainly depends, not to mention other and higher advantages. . . . If in each grade of society the members were divided into two equal bodies, the one including the intellectually superior and the other the inferior, there can be little doubt that the former would succeed best in all occupations and rear the greater number of children."[1]

The above quotations state clearly and fairly Darwin's case with regard to man; but he held emphatically that mind in animals was, though in a less degree, still in the same relation to evolution as mind in man.

"In all changes," he tells us, "whether from persecution or convenience, intelligence must come into play in some degree. The kitty-wren (*I. vulgaris*), which builds in various situations, usually makes its nest to match with surrounding objects, but this is perhaps instinct."[2]

"Mr. Swinhoe attributes the victory of the common rat [in the struggle for existence] over the large *Mus conniga*, to its superior cunning."[3]

"The social instinct is indispensable to some animals, useful to still more, and apparently only pleasant to some few animals."[4]

"With those animals which were benefited by living in close association, the individuals which took pleasure in society would best escape various dangers; whilst those that cared least for their comrades and lived solitary would perish in greater numbers."[5]

Particularly in his treatment of the evolution of the lower animals does he make a strong case for mind, stated under a quite new aspect. This is his work on "Sexual Selection;" for he makes sexual selection from first to last a psychical phenomenon, in the plainest sense of the word. Sexual selection means above all *choice*, and implies the feelings of love, jealousy, pleasure, disgust and dislike, to say nothing of the more distinctly intellectual attainments of observation and discrimination. In dealing with this, Darwin is everywhere explicit. He says, for instance:

"Sexual selection . . . . has played an important part in the history of the organic world."[6] "Secondary sexual characters . . .

[1] *Descent*, pp. 135-6; cf. the very definite statement on p. 49, and the parallel passages on pp. 93 and 617.
[2] Posthumous Essay on *Instinct*, in G. J. Romanes's *Mental Evolution in Animals*, p. 370.
[3] *Descent*, p. 80.
[4] *Instinct*, p. 381.
[5] *Descent*, p. 105.
[6] *Ibid.*, p. 613.

in the higher classes have been acquired through sexual selection, which depends on the will, desire and choice of either sex."[1] "As far as can be trusted, the conclusion is interesting that sexual selection, together with equal or nearly equal inheritance by both sexes, has indirectly determined the manner of nidification of whole groups of birds."[2]

In this last passage he declares that habit is indirectly determined, for a group of birds, by the *same agency*—sexual selection—which determines structure. It must be observed, however, that sexual selection cannot occur until some degree of intelligence has already been reached in the animal world. In a letter to F. Müller (Feb. 22, [1869?]), we find this :

"But what I want to know is, how low in the scale sexual differences occur which require some degree of self-consciousness in the males, as weapons by which they fight for the females, or ornaments which attract the opposite sex."[3]

Enough has now been quoted to show that Darwin returns an emphatic affirmative to the questions whether or not mind comes into the causal series of organic evolution at large, is actively concerned in progress, and has a survival value. We must now turn to our second question, and see what Darwin understood the term *mind* to cover.

CHAPTER II.

Unfortunately, we have to note, at the beginning of this Chapter, that Darwin failed to define his terms, and nowhere tells us in so many words what he meant to imply by "mind." After using the word for nearly a life-time, he remarks at the end of his work on Emotions,[4] which was distinctly a contribution to psychology: "I have often felt much difficulty about the proper application of the terms, will, consciousness, and intention. Actions which were at first voluntary soon become habitual, and at last hereditary, and may then be performed even in opposition to the will."[5]

I propose here to give, briefly, what appear to have been his views, and to support my statements by the quotations which seem to prove my conclusions.

If a ball be struck, it will change its position, and move in the direction of the blow; if a piece of ice be laid on a hot surface, it will change its form and condition, and melt; if a drop of acid be placed upon the skin of a brainless frog, a leg is moved toward the acid which is, if possible, wiped away.

[1] *Descent*, p. 260.
[2] *Ibid.*, p. 456.
[3] *Life and Letters*, Vol. II, p. 293.
[4] This work was written about 8 years before his death.
[5] *Emotions*, p. 357.

None of these actions are supposed to be accompanied by consciousness. Now I think that Darwin held distinctly that the movement of the leg of a brainless frog in response to the acid is of quite a different kind from the movement of the struck ball or melting ice; *it belongs to an entirely different category of phenomena from the phenomena of the merely mechanical causal series.* This is a statement somewhat difficult of proof; but the following sentence seems at least some small evidence in its favor.

"Reflex actions, in the strict sense of the term, are due to the excitement of a peripheral nerve, which transmits its influence to certain nerve-cells, and there in their turn excite certain muscles or glands into action; and all this may take place without any sensation or consciousness on our part, though often thus accompanied."[1]

It is in reflex action, even though it "takes place without any sensation or consciousness," that we find the beginning of that *something* which later is called mind. Not that Darwin held that mind developed out of, or up from, reflex action, for I think the following passage shows that he did not:

"It is scarcely credible that the movements of a headless frog, when it wipes off a drop of acid or other object from its thigh, and which movements are so well co-ordinated for a special purpose, were not at first performed voluntarily, being afterwards rendered easy through long-continued habit so as, at last, to be performed unconsciously, or independently of the cerebral hemispheres:"[2]

but reflex action seems to be the line of demarcation between the world of living matter and the world of dead, and is in some way *other than* the physical forces proper.

Higher than reflex action is instinct, and above instinct comes intelligence. Whether Darwin would have applied the term "mind" unconditionally to instinct is difficult to state, but from the general drift of his whole work it seems to me that, though he distinguished rather sharply between intelligence and instinct, he still held instinct to be in some way mind. Certainly he nowhere says it is not mind, even when he writes: "The very essence of an instinct is that it is followed independently of the reason."[3] The following may make this clear:

"Water-hens and swans, which build in or near the water, will instinctively raise their nests as soon as they perceive the water begin to rise."[4]

He goes on to cite many cases of birds apparently choosing, selecting, and acting from habit and inheritance. He did not

[1] *Emotions*, p. 35.
[2] *Ibid.*, p. 40.
[3] *Descent*, p. 122.
[4] *Instinct*, p. 370.

think that intelligence was developed from instinct, for he says in a letter to Asa Gray, of April, 1860:

"The reviewer takes a strange view of *instinct:* he seems to regard intelligence as a developed instinct, which I believe to be wholly false. I suspect he has never much attended to instinct and the minds of animals, except by reading."[1]

That animals had intelligence as well as instinct he firmly believed, though he did not consider the scope very wide, for he says quite emphatically (also in a letter to Gray): "The coolness with which he [Bowen] makes all animals to be destitute of reason is simply absurd."[2] (Nov. 26, 1860.)

And again, "only a few persons now dispute that animals possess some power of reasoning. Animals may constantly be seen to pause, deliberate and resolve."[3]

Regarding the mind of man he held simply that we have here a culmination,—a flowering,—for the whole series of organic species, but not something which differs in essence from the mind of the lower orders.

"The mental faculties of man and the lower animals do not differ in kind, though immensely in degree."[4] "The fact that the lower animals are excited by the same emotions as ourselves is so well established, that it will not be necessary to weary the reader with many details."[5] "As man possesses the same senses as the lower animals his fundamental intuitions must be the same."[6]

To the "high mental powers" of "abstraction, general conception, self-consciousness, mental individuality," he devotes a little over one page in the "Descent of Man." Here, if anywhere in his work, he shows how really little the meaning and value of his psychological terms had appealed to him. For instance, he attributes abstract ideas to some animals, and tells us that "when a dog sees another dog at a distance it is often clear that he perceives that it is a dog in the abstract [!]; for when he gets nearer his whole manner suddenly changes if the other dog be a friend."[7]

As I am to take up the development of instinct later, it will be enough here, in summing up this Chapter, to say that in a broad sense *mind* is used to cover all those attributes or powers of living beings, reasoning, abstraction, attention, self-consciousness, etc., which might be called "intelligence," and those actions and feelings which might be spoken of as "instinctive." These two, together with reflex action, Darwin included in a

[1] *Life and Letters*, Vol. II, p. 99.
[2] *Ibid.*, Vol. II, p. 146.
[3] *Descent*, p. 75.
[4] *Ibid.*, p. 147.
[5] *Ibid.*, p. 69.
[6] *Ibid.*, p. 66.
[7] *Ibid.*, p. 83.

vague, unnamed, undefined group of manifestations differing essentially from the actions and reactions of the inorganic world. He treated intelligence, instinct and reflex action as phenomena of the same general kind, and showed that they were genetically related and subject to the same evolutional laws. It is my belief that he applied the term mind, or would have applied it had he given attention to his meanings and definitions in psychology, to every manifestation occurring in living matter to which any, even the most rudimentary form of consciousness could be ascribed, whether the animal manifesting it were a single cell or a complex organism; but that in general, he restricted it to what are called the "higher" mental faculties. In other words, he simply adopted the popular view of mind.

CHAPTER III.

A difficulty strikes us at the very outset of our inquiry into the relation of brain and mind, for Darwin used the two words almost interchangeably. He summed up his views when speaking of the change which came to him in his later life, through the loss of his aesthetic interests. He says:

> "My mind seems to have become a kind of machine for grinding general laws out of large collections of facts, but why this should have caused the atrophy of that part of the brain alone on which the higher tastes depend, I cannot conceive. A man with a mind more highly organized or better constituted than mine would not, I suppose, have thus suffered, and if I had to live my life over again I would have made a rule to read some poetry and listen to some music at least once every week; for perhaps the parts of my brain now atrophied would thus have been kept alive through use."[1]

The discovery of the exact views held by Darwin on the relation of mind and brain is a task by no means easy. We have to remember that he never came to close quarters with his problem. That brain is the physical substrate of mind, and a particular brain of a particular mind, he never probably doubted, or even conceived the possibility of its being otherwise; but just what the relation of mind and brain implies, how it is effected, seems to have been equally remote to him. It strikes one with astonishment, in the midst of one's admiration for his stupendous tasks, his infinite care and his devotion to detail, to find this simplicity of view amounting almost to shallowness with regard to one of his fundamental problems,—a problem whose data he was continually collecting and collating, yet whose essence he seems to have missed to the last.

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[1] *Life and Letters*, Vol. I, pp. 81-82.

In his work on the "Expression of the Emotions" he devotes one of his longest, and in some ways, most critical chapters to *Blushing*, and gives a special section entitled, "The Nature of the Mental States which Induce Blushing."[1]

"These consist of shyness, shame and modesty; the essential element in all being self-attention. Many reasons can be assigned for believing that originally self-attention directed to personal appearance in relation to the opinion of others was the exciting cause."

Then follow several pages of citations, and then the following:

"Finally, then, I conclude that blushing—whether due to shyness —to shame for real crime—to shame from a breach of the laws of etiquette—to modesty from humility—to modesty from indelicacy—depends in all cases on the same principle; this principle being a sensitive regard for the opinion, more particularly for the depreciation of others, primarily in relation to our personal appearance, especially of our faces; and secondarily, through the force of association and habit, in relation to the opinion of others on our conduct."[2]

Notice that he has given strictly psychological causes of blushing. His theory of it, somewhat condensed, I give in his own words; in it he sets forth, as clearly as anywhere in his works, his ideas on the relation of body and mind.

"The hypothesis which appears to me most probable, though it may at first seem rash, is that attention closely directed to any part of the body tends to interfere with the ordinary and tonic contraction of the small arteries of that part. These vessels, in consequence, become at such times more or less relaxed, and are instantly filled with arterial blood. This tendency will have been much strengthened, if frequent attention has been paid during many generations to the same part, owing to nerve-force readily flowing along accustomed channels, and by the power of inheritance. Whenever we believe that others are depreciating or even considering our personal appearance, our attention is vividly directed to the outer and visible parts of our bodies; and of all such parts we are most sensitive about our faces, as no doubt has been the case during many past generations. Therefore, assuming for the moment that the capillary vessels can be acted on by close attention, those of the face will have become eminently susceptible. Through the force of association the same effects will tend to follow whenever we think that others are considering or censuring our action or character. As the basis of this theory rests on mental attention having some power to influence the capillary circulation, it will be necessary to give a considerable body of details bearing more or less directly on the subject. Several observers [a note gives the authorities], who from their wide experience and knowledge are eminently capable of forming a sound judgment, are convinced that attention or consciousness (which latter term Sir H. Holland thinks the more explicit) concentrated on almost any part of the body produces some direct physical effect on it. This applies to the movements of the involuntary muscles, and of the voluntary

[1] *Emotions*, p. 326.
[2] *Ibid.*, p. 337.

muscles when acting involuntarily,— to the secretion of the glands,— to the activity of the senses and sensations,— and even to the nutrition of parts. [Then follow some cases which I omit.] Certain glands are much influenced by thinking of them, or of the conditions under which they have been habitually excited. This is familiar to every one in the increased flow of saliva, when the thought, for instance, of intensely acid fruit is kept before the mind. . . . . We thus see that close attention certainly affects various parts and organs, which are not properly under the control of the will. By what means attention — perhaps the most wonderful of all the wondrous powers of the mind — is affected, is an extremely obscure subject. According to Müller (Elements of Physiology) the process by which the sensory cells of the brain are rendered, through the will, susceptible of receiving more intense and distinct impressions, is closely analogous to that by which the motor cells are excited to send nerve force to the voluntary muscles. . . . . The manner in which the mind affects the vaso-motor system may be conceived in the following manner: When we actually taste sour fruit, an impression is sent through the gustatory nerves to a certain part of the sensorium; this transmits nerve force to the vaso-motor center, which consequently allows the muscular coats of the small arteries that permeate the salivary glands to relax. Hence more blood flows into the glands, and they secrete a copious supply of saliva. Now it does not seem an improbable assumption, that, when we reflect intently on a sensation, the same part of the sensorium, or a closely connected part of it, is brought into a state of activity, in the same manner as when we actually perceive the sensation. If so, the same cells in the brain will be excited, though perhaps in a less degree, by vividly thinking about a sour taste, as by perceiving it; and they will transmit in the one case as in the other nerve force to the vaso-motor center with the same results. . . . . Now as men during endless generations have had their attention often and earnestly directed to their personal appearance, and especially to their faces, any incipient tendency in the facial capillaries to be thus affected will have become in the course of time greatly strengthened through the principles just referred to, namely: nerve force passing readily along accustomed channels, and inherited habit. Thus, as it appears to me, a plausible explanation is afforded of the leading phenomena connected with the act of blushing."[1]

I may pause here a moment to point out a concrete illustration of what I have called Darwin's simplicity of view almost amounting to shallowness; in this work he constantly uses (I believe for the first time, for I have failed to notice even one instance of it in his earlier works) the term "nerve force." He speaks of the *undirected flow of nerve force*, and *the undirected overflow of nerve force*;[2] *the steady flow of nerve force*;[3] *the involuntary transmission of nerve force*;[4] *radiation of nerve force*,[5] and *a thrill of nerve force*,[6]— yet nowhere does he make an attempt to tell us what this nerve force is, how it is related

[1] *Emotions*, pp. 337-344.
[2] *Ibid.*, pp. 32 and 349.
[3] *Ibid.*, p. 71.
[4] *Ibid.*, p. 68.
[5] *Ibid.*, p. 41.
[6] *Ibid.*, p. 197.

to or compares with other known physical forces; how it "flows," "overflows," "radiates" and "thrills," and, above all, what is its significance for consciousness. That it had significance for consciousness to his mind, will, I think, be evident from the context of two or three of the phrases quoted:

"The frantic and senseless actions of an enraged man may be attributed in part to the undirected flow of nerve force, and in part to the effects of habit."[1]

"This involuntary transmission of nerve force may or may not be accompanied by consciousness. Why the irritation of a nerve cell should generate or liberate nerve force is not known, but that this is the case seems to be the conclusion arrived at by all the greatest physiologists."[2]

"On the other hand many of the effects due to the excitement of the nervous system seem quite independent of the flow of nerve force along the channels which have been rendered habitual by former exertions of the will; . . . . for instance, the change of color in the hair from extreme terror or grief,—the cold sweat and the trembling of the muscles from fear."[3]

The above quotations bring out the point I made earlier, that Darwin had thought widely but not deeply upon psychological subjects, and that he never came to close quarters with some of his fundamental problems. He gives the facts clearly enough, but makes no attempt to reason them out to their legitimate conclusions. He tells us of nerve force producing action on the vaso-motor center, of undirected nerve force (in part) producing "frantic and senseless actions;" of an "involuntary transmission of nerve force" accompanied or not accompanied by consciousness; and last, but not least, of still other effects due to the *nervous system*, but *independent of nerve force*.

It may be urged that Darwin used the terms current in his day, which he obtained from the literature his quotations show him to have been familiar with. This, it seems to me, only emphasizes the fact that his psychology was at best second-hand, and that his contributions to philosophy did not lie in the exposition of the phenomena of consciousness in more than a superficial sense.

If Darwin did not define what he meant by nerve force, still less did he trouble himself with a clear statement of what he considered the exact relation of mind and brain to be. I have already quoted passages from his letters and works to show that he used the terms brain and mind interchangeably; I add one now, which occurs in the *Descent of Man*, and seems to me to carry more weight than the others:

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[1] *Emotions*, p. 349.
[2] *Ibid.*, p. 71.
[3] *Ibid.*, p. 50.

"As soon as the mental faculties had become highly developed, images of all past actions and motives would be incessantly passing through the brain of each individual. . . . As past impressions were compared during their incessant passage through the mind," etc.[1]

In spite of these quotations it is difficult to believe that he considered the brain and mind as one and the same thing,—that the mind *is* the brain,—but I do think that he looked upon the mind as in the brain (he speaks of the "frontal part of the skull" as the seat of intellectual faculties)[2] in some way, and conditioned by it; yet at the same time he speaks of "the increased size of the *brain* from greater intellectual development,"[3]—indicating that the *brain* was, on the other hand, conditioned by the *mind.*

The further manner of the relation of brain and mind was by interaction. The substance of his theory of blushing is that we have a bodily action caused by a mental one, a psychic state causing a physical response. If his explanation leaves anything to be desired in explicitness it is offset by this passage, in which he states that the *mind* affects the heart.

"Hence when the *mind* is strongly excited, we might expect that it would instantly affect, in a direct manner, the heart; and this is universally acknowledged and felt to be the case. Claude Bernard also repeatedly insists, and this deserves special notice, that when the heart is affected it reacts on the *brain;* and the state of the brain again reacts through the pneumo-gastric nerve on the heart; so that under any excitement there will be much mutual action and reaction between these two most important organs of the body."[4]

"So a man may intensely hate another, but until his bodily frame is affected he cannot be said to be enraged."[5]

"He who gives way to violent gestures will increase his rage; he who does not control the signs of fear will experience fear in a greater degree; and he who remains passive when overwhelmed with grief loses his best chance of recovering elasticity of mind. These results follow partly from the intimate relation which exists between almost all the emotions and their outward manifestation; and partly from the direct influence of exertion on the heart, and consequently on the brain. Even the simulation of an emotion tends to arouse it in our minds."[6]

In the first of these quotations he states that *mind* acts on heart, and heart reacts on *brain;* but if we assume that "mind" was meant in the second instance, we can safely say that he commits himself to an interaction theory of mind and body.

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[1] *Descent*, pp. 98 and 100.
[2] *Ibid.*, p. 55.
[3] *Ibid.*, p. 197.
[4] *Emotions*, pp. 68-9. Italics mine.
[5] *Ibid.*, p. 240.
[6] *Ibid.*, p. 366.

It is not impossible that he looked upon mind as a function of brain, though there is very little in his works to indicate this. In his book on the Emotions he quotes from Dr. Maudsley's "Body and Mind," in this passage:

"He adds, that as every human brain passes, in the course of its development, through the same stages as those occurring in the lower vertebrate animals, and as the *brain* of an idiot is in an arrested condition, we may presume that it '*will manifest its most primitive functions, and no higher functions.*'"[1]

Still we must not lay too much stress upon this paragraph.

While we are dealing with the views which Darwin held upon the relation of mind and brain, it may not be without interest to note that he never seriously entertained the concept of mind as a *secretion of brain*,—in fact he does not even mention the theory. That it was familiar to him we may justly infer because he quotes frequently from the materialistic literature of the time,—Carl Vogt and others,—in which the subject was either treated or touched upon. The fact that he never thought it worth refuting would seem to indicate that the idea of brain and mind as two distinct yet interacting entities was too firmly grounded in him to admit the consideration of any rival theories. The expression he quotes from Maudsley about "brain manifesting its primitive functions," may have meant no more to him than "manifesting those conditions or states along with which, or under which, consciousness of various kinds occurs".

Taking, then, what he actually said about interaction of brain and mind, and what he failed to say about other theories, —mind as a function or as a secretion of brain,—we may state in answer to the question: How are mind and brain related? that Darwin postulated *two distinct, interacting interdependent realities, Mind and Brain.*

CHAPTER IV.

We come now to the main problem of our inquiry—what Darwin understood by Mental Development. We already have in hand some of our chief material. We have seen that Darwin held mind to be actively concerned in progress and causally related to organic evolution at large; that by mind he meant not only the higher faculties, but instinct, and that he considered the relation of mind to body to be one of interaction.

It is not in any way within the scope of this paper to show how, given Darwin's data for organic evolution, they would work out under any of the current theories of the relation of

[1] *Emotions*, p. 246. Italics mine.

brain and mind. Of these there are at least five: Interaction, Materialism, Spiritual Monism, Parallelism, and Logical-function Relation. (1) Interaction postulates two distinct beings, or entities, brain and mind, which, however, are related, and act and react upon each other. (2) Materialism assumes mind to be a product or function of the brain. (3) Spiritual Monism holds mind to be the only real, and body some form or product of it. (4) Parallelism regards mind and brain, and the changes of each, as corresponding series of phenomena. (5) Logical-function relation proposes "a relation between two terms (mind and brain), such that *if* the one term alters, *then* the second alters also."

Darwin's views on the causal relation of mind to organic evolution at large, its activity in progress, and its survival value, committed him to an interaction theory of mind and body for the particular organism; and he was thus, in a way, bound to a concept of mental development logically the outcome of these ideas. We should thus expect to find—and in fact we do find—that he regarded mental development as a *progressive series of mutual interdependencies* of mind and body, both for evolution at large and for the individual in particular.

Darwin never believed that materialism had said, or could say, the final word in the universe, and, consequently, never held that it could be the ultimate appeal in organic evolution. He was thus debarred from holding an opinion upon either the relation of mind to body at a given moment in time, or their relation through a series of moments, or indefinite time, which would cause mind to be solely and completely conditioned by matter, or, in other words, by its physical substrate, the brain.

Before trying to show what Darwin considered the developmental relation of the mental-bodily series to be, it will, perhaps, be best to give a short outline of his views on the evolution of one of the pair—the mental. Scattered through his books are numerous passages from which we may determine his general views, and, in particular, we have the posthumous essay on Instinct, intended once for the "Origin of Species," but omitted on account of its length and published finally in Romanes's work on "Mental Development." From these it is certain that Darwin held *mind to be subject to the same laws as body*. He tells us very little about mind in the sense of *intelligence*, but confines himself almost entirely to *instinct*.

I wish to show, in what follows, how he considered Instinct to have been governed and developed by the laws of variation, inheritance and natural selection,—the same laws by which the bodily structure of an organism is determined.

In one of his letters he says: "In my fuller MS. [probably

this posthumous essay] I have discussed a good many instincts, but there will surely be more unfilled gaps here than with corporeal structure, for we have no fossil instincts and I know scarcely any except of European animals."[1]

If there were no "fossil instincts," he nevertheless "found some traces of a graduate series in instincts,"[2] which served a somewhat similar purpose; his chief emphasis is, however, on its survival value.

"An instinct, if really of no considerable importance in the struggle for life, could not be modified or formed through natural selection."[3]

"Instinct is for the preservation of the animal. . . . . There is no valid reason why it should not have been acquired through natural selection, like corporeal structures used only on one occasion."[4]

"A complex instinct might have been acquired by successive steps and which, moreover, generally indicate according to our theory, the actual steps by which the instinct has been acquired, inasmuch as we suppose allied instincts to have branched off at different stages of descent from a common ancestor and therefore to have remained more or less unaltered, the instincts of the several lineal ancestral forms of any one species; bearing all this in mind, together with the certainty that instincts are as important to an animal as their generally correlated structures, and that in the struggle for life under changing conditions, slight modifications of instinct could hardly fail occasionally to be profitable to individuals, I can see no overwhelming difficulty in our theory."[5]

In another place he says: "He who admits on general grounds that the structure and habits of all animals have been gradually evolved, will look at the whole subject of Expression in a new and interesting light."[6]

Darwin even went so far as to speak of two instincts as struggling together, and in a letter of October, 1874, gives as an instance some of his early observations of ants which carried empty cocoons from a nest to the top of a tree, which he interpreted as a struggle of the instinct to remove an empty cocoon with the instinct to carry a cocoon. His words are: "One instinct [is] in contest with another and mistaken one."[7] By this he evidently means the struggle of two instincts in the community, but not in the same individual; for some of the ants carried the empty cocoons up from the nest, and others, seeing these, carried them to a tree. He gives a more generalized case when he says: "There is a constant struggle

[1] *Life and Letters*, Vol. II, p. 34.
[2] *Instinct*, p. 378.
[3] *Ibid.*, p. 378.
[4] *Ibid.*, p. 377.
[5] *Ibid.*, p. 330.
[6] *Emotions*, p. 12.
[7] *Life and Letters*, Vol. II, p. 370.

going on throughout nature between the instinct of the one to escape its enemy and of the other to capture its prey."[1]

Perhaps the best short statement of his views is contained in one of his letters:

"Every one" (it reads) "who believes as I do that all *the corporeal and mental organs* (excepting those which are neither advantageous nor disadvantageous to the possessor) of all beings have been *developed through natural selection*, or the survival of the fittest together with use or habit, will admit that these organs have been formed so that their possessors may compete successfully with other beings and thus increase in number. Now an animal may be led to pursue that course of action which is most beneficial to the species by suffering, such as pain, hunger, thirst and fear; or by pleasure, as in eating and drinking and in the propagation of the species, or by both means combined, as in the search for food. . . . . Hence, it has come to pass, that most or all sentient beings have been developed in such a manner, through natural selection, that pleasurable sensations serve as their habitual guides."[2]

Upon variation and inheritance he has much less to say than of the survival value of instinct; in one place he speaks of "*spontaneous variations* of instincts"[3]—a term which he commonly used in referring to structures; and a great many times he tells of changes in instinct. In another place he says: "I have endeavored in this chapter briefly to show that the mental qualities of our domestic animals vary and that the variations are inherited."[4] Darwin seems to have had no doubt whatever upon the inheritability of something which *makes for*—if it be not yet—instinctive action.

"But in this case it is mental aptitude quite as much as bodily structure which appears to be inherited."[5] "Gratiolet appears to overlook inherited habit."[6] "Inherited like the tendency of a bull-dog to pin the nose of a bull."[7] "It further deserves notice that reflex actions are in all probability liable to slight variations, as are all corporeal structures and instincts, and any variations which would tend to be preserved and inherited. Thus reflex actions, when once gained for one purpose, might afterwards be modified independently of the will or habit, so as to serve some distinct purpose. Such cases would be parallel with those which, as we have every reason to believe, have occurred with many instincts; for although some instincts have been developed simply through long-continued and inherited habit, other highly complex ones have been developed through the preservation of variations of pre-existing instincts—that is through natural selection."[8]

Had Darwin said nothing more than the passages quoted,

[1] *Instinct*, p. 380.
[2] *Life and Letters*, Vol I, p. 280. Italics mine.
[3] *Origin*, p. 244.
[4] *Ibid.*, p. 275.
[5] *Descent*, p. 33.
[6] *Emotions*, p. 6.
[7] *Life and Letters*, Vol. II, p. 421.
[8] *Emotions*, p. 41.

his view of the continuity of the same laws through both structural and mental development would have been clear: but in this closing paragraph of his essay on "Instinct" he makes a statement which leaves us no doubt whatever:

"It may not be logical, but to imagination it is far more satisfactory to look at the young cuckoo ejecting its foster brothers, ants making slaves, the larvæ of the Ichneumidæ feeding within the live bodies of their prey, cats playing with mice, otters and cormorants with living fish, not as instincts specially given by the Creator, but as very small parts of one general law leading to the advancement of all organic bodies—Multiply, Vary, let the strongest live and the weakest Die."[1]

Having seen how mind, or at least instinct, evolves, and that it is ruled by the same laws which govern the "advancement of all organic bodies," we may turn our attention more particularly to the questions which it is the purpose of this Chapter to discuss, and, if possible, to answer.

"What evolves in mental evolution, mind or body?" To this Darwin undoubtedly replied: "*Both evolve.*" I have already shown that he looked upon *mind*, instinct, as evolving, and as being subject to one and the same law of organic development; a concept of mind which might almost imply spiritual monism or identity, but which to him seems to have been proof of interaction. On the other hand, a great part of his life's work was devoted to showing how structure, and consequently brain, evolve; a concept which would imply a conditioning of the psychic life by its physical substrate. That the psychic was in his opinion conditioned by, and to a large extent dependent on the physical, we may show by his own very specific statements.

"Although we learn from the above-mentioned insects, and the beaver, a high degree of intelligence is certainly compatible with complex instincts, and although actions, at first learnt voluntarily, can soon, through habit, be performed with the quickness and certainty of reflex action, yet it is not improbable that there is a certain amount of interference between the development of free intelligence and of instinct,—which latter implies some inherited modification of the brain. Little is known about the functions of the brain, but we can perceive that as the intellectual powers become highly developed, the various parts of the brain must be connected by very intricate channels of the freest intercommunication; and, as a consequence, each separate part would perhaps tend to be less well fitted to answer to particular sensations or associations in a definite and inherited—that is instinctive—manner. There seems even to exist some relation between a low degree of intelligence and a strong tendency to the formation of fixed, though not inherited habits; for, as a sagacious physician remarked to me, persons who are slightly imbecile, tend to act in everything by routine or habit; and they are rendered much happier if this is encouraged."[2]

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[1] *Instinct*, p. 384.

[2] *Descent*, p. 68.

And again: "That some physical change is produced in the nerve-cells or nerves which are habitually used can hardly be doubted, for otherwise it is impossible to understand how the tendency to certain acquired movements is inherited."[1]

The passage which I now give, and which might properly have been inserted in the Chapter on "Mind in the Causal Series," leaves no room for doubt as to Darwin's opinion of the dependence of mind upon the development of the brain; but more than that, it leaves equally no doubt of the dependence of structure—at least in evolution through a series,—upon the "exertion of choice," a purely psychic phenomenon.

"He who admits the principle of *sexual selection* will be led to the remarkable conclusion that the *nervous system not only regulates most of the existing functions of the body, but has indirectly influenced the progressive development of various bodily structures and of certain mental qualities.* Courage, pugnacity, perseverance, strength and size of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colors and ornamental appendages have all been indirectly gained by one sex or the other, through the exertion of choice, the influence of love and jealousy, and the appreciation of the beautiful in sound, color or form; and these powers of mind manifestly depend on the development of brain."[2]

It may not be out of place to notice that while these words (and others which I have given) indicate an interaction and interdependence in the developmental series, they do not imply a reciprocal action. The powers of mind seem to depend upon the condition of the brain of a particular individual at a particular moment, each change in which subtends a corresponding psychic change; while on the other hand, the "exertion of choice"—in sexual selection—works no appreciable change upon the particular organism, does not in any way modify its structure, or have application to it in point of time, but operates upon the series as a whole. In other words, mind depends immediately on what brain *is* at a given moment, but structure depends mediately on what mind *has been* at a given moment. Darwin does not state this in so many words, but the conclusion seems obvious from the data given. This does not in any way interfere with the concept of mutual interdependence in development, as the following letter to Lyell (June 6 [1860]) will show:

"I suppose Lowell's difficulty about instinct is the same as Bowen's, but it seems to me wholly to rest on the assumption that instincts cannot graduate as finely as structures. I have stated in my volume that it is hardly possible to know which, *i. e.*, whether instinct, or structure, change first by insensible steps. Probably sometimes instinct, sometimes structure. When a British insect feeds on an exotic plant, instinct has changed by very small steps, and their structures

[1] *Emotions*, p. 29.
[2] *Descent*, p. 617. Italics mine.

might change so as to fully profit by the new food. Or, structure might change first, as the direction of tusks in one variety of Indian elephants, which leads it to attack the tiger in a different manner from other kinds of elephants."[1]

"*As the various mental faculties gradually developed themselves the brain would almost certainly become larger.* No one, I presume, doubts that the *large proportion which the size of man's brain bears to his body is closely connected with his higher mental powers.* We meet with closely analogous facts with insects; for in ants the cerebral ganglia are of extraordinary dimensions, and in all the Hymenoptera these ganglia are many times larger than in the less intelligent orders, such as beetles. On the other hand, no one supposes that intellect of any two animals or of any two men can be accurately gauged by the cubic contents of their skulls. It is certain that there may be extraordinary mental activity with an extremely small absolute mass of nervous matter; thus the wonderfully diversified instincts, mental powers, and affections of ants are notorious, yet their cerebral ganglia are not so large as the quarter of a small pin's head. Under this point of view, the brain of an ant is one of the most marvellous atoms of matter in the world, perhaps more so than the brain of a man.

The belief that there exists in man some close relation between the size of the brain and the development of the intellectual faculties, is supported by the comparison of the skulls of savage and civilized races, of ancient and modern people, and by the analogy of the whole vertebrate series. Dr. J. Barnard Davis has proved, by many careful measurements, that the mean internal capacity of skull of Europeans is 92.3 cubic inches; in Americans 87.5; in Asiatics 87.1; and in Australians only 81.9 cubic inches. Prof. Broca found that the 19th century skulls from graves in Paris were larger than those from vaults of the twelfth century, in the proportion of 1484 to 1426; and that the increased size, as ascertained by measurements, was exclusively in the frontal part of the skull — the seat of the intellectual faculties. Prichard is persuaded that the present inhabitants of Britain have "much more capacious brain cases" than the ancient inhabitants. Nevertheless it must be admitted that some skulls of very high antiquity, such as the famous one of Neanderthal, are well developed and capacious. With respect to the lower animals, M. E. Sartet, by comparing the crania of tertiary and recent mammals belonging to the same groups, has come to the remarkable conclusion that the brain is generally larger and the convolutions are more complex in the more recent forms. On the other hand, I have shown that the brains of domestic rabbits are considerably reduced in bulk, in comparison with those of the wild rabbit or hare; and this may be attributed to their having been closely confined during many generations, so that they have exerted their intellect, instincts, senses and voluntary movements but little.

The gradually increasing weight of the brain and skull in man must have influenced the development of the supporting spinal column, more especially whilst he was becoming erect. As this change of position was being brought about, the internal pressure of the brain will also have influenced the form of the skull; for many facts show how easily the skull is thus affected. . . . . Lastly, if any animal were to increase or diminish much in general size, without any change in its mental powers, or if the mental powers were to be much increased or diminished, without any great change in the size of the

[1] *Life and Letters*, Vol. II, pp. 111, 112.

body, the shape of the skull would almost certainly be altered. . . . . From these several facts we can understand, to a certain extent, the means by which the great size and more or less rounded form of the skull have been acquired by man; and these are characters eminently distinctive of him in comparison with the lower animals."[1]

These passages state, it seems to me, with adequate clearness that Darwin considered the development of any brain in the animal series to be closely correlated with the degree of intelligence manifested. Darwin held that not only was there a progressive series of minds, but that those minds had been derived, the one from the other, by the natural processes of inheritance and modification of the total organism, and that a common progenitor for mind was *given with or in* the common progenitor for body. By this means he accounts for the similarity of taste, feeling, emotion, etc., which he notes as existing throughout the animal kingdom.

"To maintain independently of any direct evidence that no animal during the course of ages has progressed in intellect or other mental faculties is to beg the question of the evolution of species. We have seen that according to Sartet, existing mammals belonging to several orders have larger brains than their ancient tertiary prototypes."[2]

"Every one who admits the principle of evolution, and yet feels great difficulty in admitting that female mammals, birds, reptiles and fish, could have acquired the high taste implied by the beauty of the males, and who generally coincide with our own standard, should reflect that the *nerve cells of the brain in the highest as well as in the lowest members of the vertebrate series, are derived from those of the common progenitor of this great kingdom.* For we can thus see how it came to pass that certain mental faculties, in various and widely distinct groups of animals, have been developed in nearly the same manner and to nearly the same degree."[3]

"If no organic being excepting man had possessed any mental power, or if his powers had been of a wholly different nature from those of the lower animals, then we should never have been able to convince ourselves that *our high faculties had been gradually developed.* But it can be shown that there is no fundamental difference of this kind. We must admit that there is a much wider interval in mental power between one of the lowest fishes, as a lamprey or lancelet, and one of the higher apes, than between an ape and a man; yet this interval is filled up by numberless gradations.

Nor is the difference slight in moral disposition between a barbarian, such as the man described by the old navigator Byron, who dashed his child on the rocks for dropping a basket of sea-urchins, and a Howard or Clarkson; and in intellect, between a savage who uses hardly any abstract terms, and a Newton or Shakspeare. Differences of this kind between the highest men of the highest races and the lowest savages are connected by the finest gradations."[4]

"As far as I understand your remarks and illustrations, you doubt

[1] *Descent*, pp. 54-6. Italics mine.
[2] *Ibid.*, p. 81.
[3] *Ibid.*, pp. 616-17. Italics mine.
[4] *Ibid.*, pp. 65-6. Italics mine.

the possibility of gradations of intellectual powers. Now, it seems to me, looking to existing animals alone, that we have a very fine gradation in the intellectual powers of the Vertebrata, with one rather wide gap (not half so wide as in many cases of corporeal structure) between say a Hottentot and an ourang, even if civilized as much mentally as the dog has been from the wolf. I suppose that you do not doubt that the intellectual powers are as important for the welfare of each being as corporeal structure; if so, I can see no difficulty in the most intellectual individuals of a species being continually selected, and the intellect of the new species thus improved, aided probably by effects of inherited mental exercise. I look at this process as now going on with the races of man; *the less intellectual races being exterminated.* . . . . If I understand you, the turning point in our difference must be, that you think it impossible that the intellectual powers of a species should be much improved by the continued natural selection of the most intellectual individuals. To show how minds graduate, just reflect how impossible every one has yet found it, to define the difference in mind of man and the lower animals; the latter seem to have the very same attributes in a much lower stage of perfection than the lowest savage. I would give absolutely nothing for the theory of natural selection, if it requires miraculous additions at any one stage of descent."[1]

"Your criticism of the rasping noise made by insects being necessarily rhythmical is very good; but though not made intentionally, it may be pleasing to the females from the nerve cells being nearly similar in function throughout the animal kingdom."[2]

The quotations I have given seem to me sufficient to exhibit and explain the Darwinian Idea of Mental Development. Simply stated, mental development for all the organic species, means a *progressive series of mutual interdependencies.* This idea was the outcome of Darwin's concepts of mind and its changes, and of its relation to brain. Neither mind nor brain evolves alone, hence, neither conditions the other more than it is itself conditioned; but together they make a continuing process, ever more differentiated, more complex; a process, which, taken in its entirety, we recognize and describe as Mental Development, both for the individual and for the race.

Summary.

We have seen (1) that Darwin believed that mind is causally related to organic evolution; (2) that by mind he meant the specific manifestations of a living organism and its reactions upon its environment as distinguished from the merely mechanical reactions; (3) that he held the relation of mind and body to be one of interaction and interdependence; and (4) that Mental Developement is a progressive differentiation, accompanied by, and causally interrelated with the development of the body. How, then, shall we sum up his position,

[1] Letter to Lyell, in *Life and Letters*, Vol. II, p. 7. Italics mine.
[2] *Life and Letters*, Vol. II, p. 364.

and where, in the history of thought, do his philosophical affinities place him?

There can be little doubt from the foregoing that Darwin held the views taught in the popular psychology of his day, which adhered strictly to Cartesian dualism in its explanation of the relation of mind and body. This psychology held "that the substances of the world are divided into minds and bodies; that minds are not in space, while bodies are extended; that minds obey the laws of thought, and bodies the laws of mechanics; that minds are free, and bodies subject to a blind causality; and that, nevertheless, these different forms of existence are occasionally connected with one another, and can influence each other."[1] All this is a matter of course to the great majority of unphilosophical, educated men.

Cartesianism is a statement of what may be called the static relationship of mind and body: it endeavors to account for a particular mind and a particular body at a particular time. Upon this foundation Darwin now builds a new structure. One group of phenomena had early assumed an immense importance to him,—the phenomena of *inheritance*. The thought of hereditary transmission, perhaps always foremost in his biological studies, had deeply imbued him with the idea of life as expressed in an organic series, as well as in a single form. He saw that living beings were not only maintaining their individual interactions of brain and mind, but that these interactions were changing and progressing,—progressing in a definite direction, moving onward, under the laws of inheritance, from the lower to the higher, from the simpler to the more complex. To the facts of the given moment he added the facts of a period of time; to the laws governing the individual, the laws governing the species; and to the concept of the mere existence of a living being, the concept of the development of that being, and the evolution of the series of which it forms, by inheritance, a causally related link. Darwin's philosophical position may thus be summed up in three words, as *Cartesianism plus Evolution*.

Appendix.

It may not be without interest, as bearing upon Darwin's views of mental development, to note the psychological literature with which he was evidently familiar and which he quoted, and also some of the important works of the time which he seems not to have known. I select the following titles from the foot-notes of the "Origin of Species," "Descent of Man" and "The Expression of the Emotions in Man and Animals," and include in it a few works which are not strictly psychological, but which seem in place here.

[1] W. Wundt: *Essays*, p. 130.

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It is to be noticed that Darwin quoted from books published as late as 1873, the year of the publication of his last philosophical work, "The Expression of the Emotions." To the following (though very incomplete) list of important works I have failed to find reference throughout his writings, or in his "Life and Letters." These, with the exception of the "Life and Letters," were all published previously to the above date. This omission, from a man so scrupulous in giving his authorities, would appear to mean, either that he did not keep up with the current psychological and philosophical literature, or that, knowing these works, he never found occasion to mention them. The latter assumption, in view of the large use he made of the researches and writings of others in supporting his own views, seems absurd; and we are justified in assuming that Darwin was not familiar with them.

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THE INFLUENCE OF FORCED RESPIRATION ON PSYCHICAL AND PHYSICAL ACTIVITY.

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The effect of various psychical and physical activities upon respiration has been investigated by psychologists and physiologists, and intimate relations have been established. These relations, however, have been studied but rarely from the reverse standpoint, though there is good ground for deeming such a study profitable.[1] The following study is an attempt to investigate one of these reverse relations, that, namely, which exists between voluntarily increased rapidity of breathing and various types of physical and psychical activity.

INTRODUCTORY.

A review of the physiology of respiration shows that forced respiration might influence these activities especially in two ways: by increasing the amount of available oxygen in the blood or tissues, and by influencing the rate of circulation and the composition of the blood.

With regard to the first, it is obvious that since the haemoglobin of the blood is normally nearly saturated with O, no amount of forced breathing can greatly increase the amount of O in the blood and so in the tissues unless there is a concomitant change in the rate of circulation. Yet the amount of CO_2 eliminated might be increased by thorough ventilation with normal circulation, and so a relative oxygenation be accomplished. A practical example of the reverse case occurs in "loss of wind" in running, which is often due, not to lack of air inhaled, but to lack of heart power to drive the oxygen-carrying blood to the tissues. It is further clear that no amount of fast breathing or rapid circulation can wholly atone for a paucity of red corpuscles and haemoglobin.

The effect of forced respiration on circulation may be either direct (impeding or assisting the flow of blood to and from the heart) or indirect, by the reaction of the changes in the compo-

[1] This topic was suggested to the writer by President Hall, who has treated many of the more general aspects of the relation of respiration and the air to mental activity, in his class lectures on Cosmology, and I desire here to acknowledge my indebtedness to him and to the subjects who have spared time for my tests.

sition of the blood upon the nervous centers presiding over this function.

The principle that inspiration increases the flow of blood from the brain, while expiration hinders it to such an extent that the brain is raised with each expiration, may perhaps account for a peculiar feeling in the top of the head observed by several of the subjects of our experiments during the forced breathing, and described as an odd mixture of pressure and vacuity.

The general relation of the activity of the nervous centers for circulation and respiration to the proportion of CO_2 in the blood is too well known to need illustration, but the conditions in apnœa (momentary cessation of respiration) are not altogether clear, and as this appears to be a regular sequel of such forced breathing as we have used, it may be worth a little consideration. There are two main theories, the chemical and the mechanical.

The first is especially supported by the work of Ewald, who claims that after a period of forced breathing, the system and the blood become hyperoxygenated. The medulla is thus quieted by the presence of much O and little CO_2, and there is a more or less complete cessation of respiratory movements. This is borne out by the fact that the fœtus in its prenatal condition is kept from breathing by the presence of blood richly charged with O, and by certain experiments of Ewald who found that venous blood in apnœa contained less than the normal amount of O, and by Pflüger's experiments showing a slowing of the capillary circulation during apnœa so that a larger amount of O may be taken up by the tissues.

Those who hold the mechanical theory that apnœa is caused by a weariness of respiration (a fatigue, reacting on the medulla by the vagus nerve, which suppresses its activity), argue that it cannot be proved that the blood is hyperoxygenated, and that, further, artificial forced breathing of H by animals causes apnœa.

Gad, Knoll and others hold that the cause is chemical, but due not to hyperoxygenation of the blood, but to the presence of much atmospheric air in the alveoli, which are able to arterialize the blood for some time, but at the normal rate.

Reichert, in the "American Text Book of Physiology," in commenting on this mooted question concludes that "in view of the fact that apnœa from breathing O is much more marked than from breathing H, it seems evident that apnœa may be due to either gaseous or mechanical factors alone or to both, the latter producing a quicker and more lasting effect."

A recent work on respiration, and one which touches some points identical or closely related to those taken up in the pres-

ent study, is that of William Marcet, entitled "A Contribution to the History of the Respiration of Man," London, 1897.

Marcet is interested in the medical aspects of respiration, and concerned with the effect of mountain climbing, high altitudes, temperature, food, exercise, etc., on respiration, and the effects of forced respiration or volition, towards forced respiration on muscular power. He studied also the after stages in each case, and tested by elaborate apparatus the amounts of air breathed and the proportions of O consumed and CO_2 eliminated in the various tests. He demonstrates the apnœic pause after forced breathing and finds also a second short period of increased breathing always following the apnœa. He finds that an excess of CO_2 is eliminated from the blood by the forced breathing and an excess of O of from 4.7 to 36.4 cc. per minute, is absorbed under the same conditions, thus strongly supporting Ewald's theory of apnœa. It is also an important fact that the same rate and depth of respiration, which in forced breathing gives rise to apnœa, when it occurs as a natural concomitant of muscular exercise, excites no fatigue and is followed by no apnœa.

Active volition towards some form of exercise, locomotion, lifting, etc., gives on the other hand tracings with after-stages like the forced breathing curves. Marcet finds that forced breathing nearly doubles muscular power and explains it by the fact that the increased absorption of O takes place mainly in the cerebral motor centers, a point of great interest if it shall eventually be confirmed. His conclusions as to apnœa are peculiar. Like Ewald, he finds more O absorbed, but unlike him, argues (from his experiments) that apnœa is purely an after effect of volition. Only when there is volition toward *muscular* contraction does apnœa occur. Under these circumstances, the cause of the increased breathing is a direct action of a motor center (the one that would be concerned in the muscular contraction if one were made) upon the respiratory center. In forced breathing many accessory muscular contractions are made and the overflow to the respiratory center is from the centers involved in them. Now when volition toward muscular contraction is suddenly suspended (or at the end of the forced breathing) the respiratory center is left unsupported, and missing the added stimulus before received, is sluggish in action, and apnœa results.

Experiments on the Effect of Forced Respiration on Physical and Mental Processes.

The writer's experiments were carried out upon six subjects, all university students (five Americans and one a Japanese), between March 2nd and June 14th of the current year. They

have been for the most part somewhat rough in character, intended rather to blaze a path in a new direction and to find general bearings than to make exact determinations of particular points.

The tests of physical and mental conditions used were :

1. Dynamometer grip continued through 30 seconds.
2. Adding of digits.
3. Dealing of sixty cards into two piles.
4. Simple reaction time to sound.
5. Discrimination and choice tested by the sorting of sixty cards according to color, red and black.
6. Memory span.
7. Precision of rapid touches.
8. Threshold in discrimination of gray.

Each subject on each day went through the same series of tests both in normal condition and after two minutes of forced breathing. In the latter case each test was made if possible entirely within a single minute directly following the breathing.[1] If the test occupied a longer time, additional breathing periods were inserted. The tests were made on eight days for each subject, exclusive of the preliminary trials which were designed to eliminate most of the practice effects. On four days the normal tests were made first, on alternate days the forced breathing first, thus balancing in the totals any daily effects of warming up, practice or fatigue. Each complete series occupied one hour.

On another day, tracings of the subjects breathing under the various conditions were taken by means of two pneumographs (of the pattern devised by Dr. Fitz, of Harvard,) and a continuous paper kymograph driven by a water motor. Each tracing shows the chest and abdominal breathing and a time curve with 2 sec. intervals.

These tracings reveal a more or less complete apnœic pause (an extreme case lasting over two minutes) after the forced respiration. Differences in rate, depth and character of the movements in the forced period, and considerable individual differences in the types of normal breathing are also brought out, *e. g.*, variations in the rate of the forced breathing among the subjects are from 19 to 36 per minute ; variations in the form are also marked, some subjects increasing the chest movement, some the abdominal ; for some, pure apnœa is replaced by very slow, slight respirations with long expiratory pauses ; some

[1] In comparing the results of these experiments with those of Marcet it should be remembered that his tests of strength, etc., were made after normal automatic respiration had been established, while these were made as soon as possible after the cessation of the forced breathing.

normal curves show predominance of diaphragmatic, some of costal breathing.

The subjective effects of the forced breathing were in general: more or less dizziness, blackness before the eyes, tingling or prickling sensations in the hands and feet, and a feeling of confusion coupled with energy. Not all these were experienced at once, and all passed away with the cessation of forced respiration. There was often a secondary effect of exhilaration.

Before the special tests, the lung capacity was each day tested with a spirometer. The highest and lowest amount registered by the spirometer and also the average for each subject will be found in Table I, together with his height and weight.

TABLE I.

SUBJECT.	HEIGHT.	WEIGHT.		SPIROMETER.		
	Cm.	Lbs.	Oz.	Min. Cu. in.	Max. Cu. in.	Av. Cu. in.
J	172.3	137	6.5	190	220	207
Y	156.3	113	8.0	162	180	175
G	176.9	159	14.0	230	259	244
H	171.6	143	8.0	227	255	240
P	170.3	167	10.5	200	240	221
S	168.1	159	2.5	237	257	247
Average	169.2	146	1.6	208	235	222

The first of the regular daily tests was that with the *Dynamometer*. The apparatus was essentially that used by Bryan,[1] but only one hand was tested, and an attachment was made by which a reduced tracing of the fatigue nerve could be obtained. The subject maintained a maximum pressure for 30 seconds, the height of the mercury column being also recorded by the experimenter at the beginning and end of this period, and the form of the fatigue curve being registered on a kymograph drum. The results of these tests show a more or less decided gain both in initial strength and in endurance after the forced breathing. The average numerical readings in centimeters are given in the following Table.

One subject (Y) was unable to hold the mercury for the full period of 30 seconds. His curves showed a peculiar, sudden drop at about the 15th or 20th second. This was occasionally the case with subject H.[2] In further tests on subject Y at the close of the regular work, he was found able to sustain the mercury for the full period of 30 seconds after forced breathing, but was

[1] This JOURNAL, V, 196.

[2] Something of the same kind was observed by Lombard in his study of ergograph curves. This JOURNAL, III, 24.

TABLE II.[1]

Dynamometer.

SUBJ.	NORMAL.				FORCED.			
	Beginning.	M. V.	End.	M. V.	Beginning.	M. V.	End.	M. V.
J	74.3	4.0	60.6	3.3	73.1	6.9	60.5	4.2
Y	[71.5]	[7.5]			[73.6]	[6.0]		
G	91.4	5.4	68.4	3.0	94.0	4.9	73.3	3.7
H	75.7	3.9	55.5	4.5	79.0	5.0	58.5	4.5
P	82.5	4.3	53.6	6.9	90.5	2.6	58.8	2.3
S	84.1	9.0	58.0	9.5	85.5	8.0	56.3	10.9
Av.	81.6	5.3	59.2	5.4	84.4	5.5	61.5	5.1

still unable to do so in the normal condition. This affords an interesting support to the general conclusions attained. The figures for H are for four days only.

The curves given by this apparatus show great variety from subject to subject, but those of any single subject are extremely uniform in character as has been found by others in similar studies.

The effects of practice, warming up, and fatigue were excluded from the final results as before explained. Averages of the results according to the order specially made to discover such effects show that in the dynamometer test these factors hardly enter at all, or balance each other in amount.

Adding. The next test, taking them up in the order given to the subjects, was adding. Eight columns of 17 numbers each were added each day, the time being taken with a stop-watch and the correctness of the results being noted. The columns all footed up between 131 and 142, and were of approximately equal difficulty. The results show no certain difference between the times required for adding after normal and after forced breathing; two subjects add slightly faster, and four slightly slower after the breathing, while the net result is .12 seconds faster for the breathing. The breathing also did not affect the correctness of the work. Interesting individual differences are found, and a strong practice curve shown.

Rapidity of Movement, Card Dealing. The next test was designed to measure the rapidity of movement, and consisted of dealing a pack of 60 specially prepared cards into two piles. Such card tests are of little use to people who lack sufficient manual dexterity to deal them one at a time. This was the case with one at least of the subjects, and in all cases there was a strongly marked practice curve.

[1] M. V. in this and subsequent tables represents the mean variation of the eight daily records from their average.

The dealing test also gave negative results, being faster under forced breathing for three subjects and slower for two, with total averages equal. The sixth subject was so irregular in dealing that a substitute test was provided, consisting simply of making small crosses with a pencil at maximum speed for 30 seconds. This was not a very satisfactory test, but showed, so far as it showed anything, the same negative results as the other.

Simple Reaction Time. The fourth test was the simple reaction to sound. At first this was taken by means of an electric tuning fork, vibrating 100 times per second, writing through a small electro-magnetic signal on a smoked drum. For this method was later substituted the more accurate Hipp Chronoscope with a falling-ball stimulus. With the first apparatus from 30 to 40 reactions were made each day, with the Hipp 20.

The results show that five subjects average longer in reacting after the breathing, the sixth takes only 0.0004 longer in the normal condition, a difference so small as to be negligible. The average is 4.25 σ longer after forced breathing. The number of daily tests in which forced breathing lengthens the time is also greater than half, so that it is probably safe to say that forced respiration has some slight tendency to lengthen the simple reaction time.

The averages for reactions are here given:

TABLE III.[1]

Reactions.

SUBJECT.	NORMAL.	M. V.	FORCED.	M. V.	F-N.
	σ	σ	σ	σ	σ
J	145.0	7.9	147.0	13.2	2.0
Y	134.0	9.0	139.6	6.6	5.6
G	141.8	6.6	144.9	6.5	3.1
H	143.7	10.6	148.9	10.5	5.2
P	132.0	6.7	131.6	4.9	−0.4
S	141.6	4.0	151.6	4.5	10.0
Average	139.7	7.5	143.9	7.7	4.25

Discrimination Test, Sorting Cards by Colors. The second form

[1] Owing to a loss of some records, the mean variations in the *individual* reaction times of all the subjects cannot be given. Incomplete records for four subjects show an average of the mean variation in the reactions in normal condition of 13 σ, under forced breathing of 16 σ. The slightly greater variation in the latter case may be due to the fact that when using the Hipp Chronoscope, the subject was made to do forced breathing before each reaction. This, in itself, may have lessened the constancy of attention.

of card test is next in order. It consisted in sorting from four to six times the well shuffled pack of 60 cards into two piles, this time according to color—black and red—as a rough index of the discrimination time plus the above mentioned dealing time. Subjects were required to make a quick motion of correction in case a card was wrongly placed. The time was taken by stop-watch. The general remarks about the dealing test apply also here though to a less degree.

The results (v. Table IV) show on the average a slightly lower sorting time after forced breathing. This longer time, since the dealing test gave negative results, may be attributable to the more purely mental process of discrimination, but may be due, as suggested by the tests in discriminating grays, to poorer perception of the colors. Four of the five subjects show this tendency; the fifth leans very slightly the other way, while in the case of a sixth, the cards were again of no avail and a special discrimination test had to be arranged—reactions with right or left hand to two slightly different sounds. The results of the sorting test are given below in seconds.

TABLE IV.

Sorting 60 cards.

SUBJECT.	NORMAL.	M. V.	FORCED.	M. V.	F-N.
J	53.06	2.05	54.45	1.44	1.39
Y	45.06	2.33	45.61	1.52	.55
G	50.04	1.39	49.64	0.62	.40
H					
P	41.27	1.62	42.41	2.32	1.14
S	45.34	2.33	45.79	1.83	.45
Average	46.95	1.94	47.54	1.54	0.706

The discrimination tests on subject H with the chronoscope, confirmed the general result from the card sorting. The average normal time was $340 \pm 2\sigma$ with an average mean daily variation of 41σ; the average after forced breathing was $356 \pm 7\sigma$ with an average mean daily variation of 45σ.

Test No. 6 was a test of *memory*. At first series of ten printed nonsense syllables were exposed for the subject's study during a period of 30 seconds. This method was found poor, however, in practical working, since the subjects changed their method of learning; now visualizing, now committing by articulating, now by sound, and now by association; and the results were not at all uniform. A method free from most of these defects was found in testing the memory span with numerals read by the experimenter in time with a pendulum swinging once in .74 sec. This insured uniform speed. Nine numerals

were commonly used, but ten were necessary for subjects P and S after a day or so of practice. The results were obtained by recording the number of errors made by the subject, in writing the numbers immediately after dictation. Errors in position as well as in the digits themselves were counted. Unfortunately no record of the number of transpositions (the most frequent error) was kept.

With the exception of one subject (Y, a Japanese), the results uniformly show more errors after the breathing and the final average points in that direction. The one exception may be due to a fact revealed towards the end of the experiment that the memorizing was sometimes done in English, sometimes after translation into Japanese. I have therefore omitted his results in the average.

TABLE V.

Memory.

SUBJECT.	NORMAL.	M. V.	FORCED.	M. V.
J	18.50	3.12	19.70	2.57
Y	[25.00]	[4.25]	[22.60]	[2.22]
G	4.87	1.59	6.62	3.62
H	5.50	2.40	7.46	3.04
P	2.13	1.87	4.50	2.50
S	2.37	1.62	3.37	2.00
Average	5.56	2.12	6.94	2.74

The test for *precision* of aim caused considerable trouble before a suitable one was found. The form of test finally used seems to combine all the necessary points, viz.: the same frequency and speed in the thrusting movement, impossibility of correction by practice, an easy evaluation of the results, and the securing of a large number of tests without too great waste of time. It consists in having the subject try to touch, with a lead pencil, moving it in time with the beat of a .74 sec. pendulum, a series of ten small crosses irregularly placed on a sheet of paper, the pencil being raised each time to the height of the shoulder. This process was repeated, making a total of 20 thrusts after each form of breathing. The error is given in the table in millimeters.

The results from this test show that while, as would be expected, the error of each single thrust is quite variable, the average errors of a series of 20 thrusts are an almost constant quantity for each subject after the first practice effect has passed. The results also show a clear and regular increase in the errors after forced breathing.

Table VI shows the general averages for each subject, and the

averages of the daily mean variations. The probable errors of the general averages, though not given in the table, are very small, and justify the conclusion that forced breathing increases the error.

TABLE VI.

Precision.

SUBJECT.	GENERAL AVERAGE.				AVERAGE OF DAILY M. V.	
	Normal Breathing. Mm.	M. V. Mm.	Forced Breathing. Mm.	M. V. Mm.	Normal Breathing. Mm.	Forced Breathing. Mm.
J	4.05	0.39	4.88	0.43	1.80	1.89
Y	3.93	0.46	4.51	0.47	1.62	2.18
G	5.30	1.09	5.51	0.66	2.82	1.95
H	6.18	0.69	6.61	0.89	2.65	2.65
P	5.02	0.67	5.99	1.01	2.64	2.74
S	4.54	0.24	4.95	0.24	2.35	2.44
Average	4.84	0.59	5.41	0.61	2.31	2.31

The order had considerable influence in this test, five out of six subjects being more accurate in the second half hour irrespective of whether the forced breathing tests came first or those with normal breathing.

Discrimination of Grays. The final test was intended to be more purely sensory than those which have been given. It was visual, and consisted in a determination of the just observable difference of grays. The apparatus was a modification of that used by Leuba, and described in this JOURNAL, V, 376. A rapidly revolving vertical pasteboard disk 368 mm. in diameter and pierced with 12 radial slits each, 138 x 13 mm. was interposed between the subject and the grays to be discriminated. The disk was covered with white (later light gray) paper, and arranged to slide vertically for a distance of 120 mm. The subject being seated before a tube 61 cm. long in front of the disk, looked through the tube and the disk at figures of various forms (square, triangle, hexagon, letter H, etc.), which were made of quite dark gray paper approximately 70 mm. square, and pasted in the center of a background of a very little darker gray paper 153 mm. square. These diagrams were 270 cm. beyond the disk. When the disk was low down in its slide, so that the subject looked through the upper part of it, the grays of the figure and background could not be distinguished, and the form of the figure could not be told. In making a determination, then, the disk was raised till the figure could be discriminated from its ground and correctly named, when the elevation of the disk in millimeters was recorded. The conditions of the tests allow the results only a

relative value because of variations in illumination. Constant lighting could not be secured in the present case, and often tests were thrown out on account of variations in the outdoor light during the eight or ten minutes used in the test. The results, however, are sufficient for a comparison of the effects of forced and normal breathing. In making the test, each subject on each day was given five diagrams in the first test, and the same five in the second, though altered in order and in their position in the holder. The results from this test were very striking.

The average for every subject, not only in the totals, but for every day's tests, shows that the diagrams appear later, more confused, and are distinguished with more difficulty after the forced breathing.

In these tests the subjects had curious illusions and apperceptive experiences, *e. g.*, two upright parallel lines were often declared with certainty to be the "H." These phenomena increased with the forced breathing, which was uniformly said to make the figures hazy and flickering, even to such an extent that after the given figure was recognized, it seemed to some subjects to slide and alter its position on the background. Others found that in forced breathing, the whole diagram suddenly shifted in color, being alternately black or gray, or again a gray would appear in the center and gradually spread out to the borders.

The *tests of the effects of forced breathing upon circulation* have been of a tentative nature and few in number. The pulse rate of the various subjects before, during and after the forced breathing was once counted, and showed a slight quickening during the second minute of breathing; but by two minutes of the cessation of the forced respiration, the pulse had usually fallen again to the normal rate. A couple of tests of the eye pulse were made with the plethysmograph,[1] but with negative results.

If we now sum up the general results of this study we find the effects of forced breathing to be

1. An apnœic pause, as observed by Marcet.
2. A feeling of dizziness and confusion, followed somewhat later at times by exhilaration and clearness.
3. Greater strength and endurance of grip, found also by Marcet, but after an interval in which breathing returned to the normal condition.
4. Slightly lengthened reaction time.
5. Decreased memory span.
6. Longer discrimination time.

[1] *Psychological Review*, IV, 120.

7. Less precision of movement.
8. Poorer visual discrimination.

The simple throwing of cards in two piles and adding are apparently uninfluenced. Whether with more extended experiments this would be the case cannot now be asserted, but, these apart, the results seem to point to an improvement of the muscular mechanism, as the expense of the mechanisms of control and of the higher functions generally.

It would be interesting to follow the subject into the fields of early philosophy, where, as every one knows, breathing and soul have often been practically synonymous, and into the modern oriental cults where proper breathing is regarded as the road to insight and inspiration, and into the hygienic developments of respiratory gymnastics in the modern "deep breathing" schools, and among the "Ralstonians," but these are all quite beyond the scope of the present paper, which is confined to the report of experimental pioneering.

A METHOD OF RECORDING EYE-MOVEMENTS.

By E. B. DELABARRE, Professor of Psychology, Brown University.

Many problems suggest themselves to the psychologist whose solution would be greatly furthered by an accurate method of recording the movements of the eye. One such problem in particular has aroused my interest, namely, the relation of eye-movements and eye-strain to our spatial judgments, and the bearing of this relation on the explanation of various geometrical optical illusions. While I cannot claim to have completely solved the problem of obtaining an accurate record of the movements made by the eye under such circumstances, I nevertheless have succeeded in reproducing them with a certain degree of accuracy; and by publishing my method in spite of its crudeness in certain respects, I hope to be of service to others who may be engaged on similar problems, and to receive suggestions for its further perfection.

After considering and testing numerous possibilities, I was forced to the conclusion that only by firmly attaching some solid object to the surface of the eye or to the eye-muscles, as a support to a mirror or to a thread for moving levers, could my object be obtained. I am indebted to Dr. Lough, my assistant last year in the laboratory at Harvard, for the suggestion that plaster-of-Paris will attach itself firmly and immovably to any moist surface. Acting on this suggestion, I made a few plaster casts over the cornea of an artificial eye. I thus produced a smooth concave surface that would fit fairly well the curvature of the cornea of a natural eye. This I trimmed with a knife to the diameter of the cornea, and to a thickness that would make it as light as possible while retaining the requisite firmness. Then I made the eyeball anæsthetic by applying two or three drops of a two to three per cent. solution of cocaine, and on fitting the cast over the cornea found that it held there perfectly, without pain or discomfort.

The problem of obtaining a firm support was thus solved. How to use it for obtaining a record of the eye-movements was yet a question. My first attempt was to fasten to the outer surface of the plaster cast a small concave mirror of known focus, and to reflect from it a strong ray of light onto a photographic plate. This reflected ray reproduced accurately and magnified all the movements of the eye. I found difficulty, however, in

obtaining a record of its path on the sensitive plate, and was compelled to abandon the attempt. This difficulty arose partially from the rapidity with which the spot of light moved across the plate, but partly also no doubt from my own unfamiliarity with the dispositions of apparatus necessary for obtaining a sharply defined image of the light-streak under such conditions. It seems to me probable that this photographic method is feasible, and I hope that this account may come to the notice of some one who can give me directions for making it successful.

I finally adopted the method of casting within the plaster a thin wire ring, from one side of whose circumference a branch projected to the outside. It was then possible to make a hole through the center of the cast, of about the size of the pupil. The wire ring surrounded this hole, imbedded within the plaster, and to its projection, situated just to one side of the opening, it was easy to attach a light thread leading to a recording lever. On the side of the lever opposite to the attachment of the thread I fastened a thin elastic fibre, and thus the lever moved back and forth in correspondence with the horizontal movements of the eye, and recorded them on the smoked surface of a kymograph cylinder. By running the thread over a pulley, it was similarly possible to record the vertical movements. Slow movements could thus be recorded with great accuracy. But in the case of the more natural rapid movements, the tendency of the lever and elastic fibre to continue vibratory movements of their own after those of the eye had ceased led to some results difficult to interpret. The periodicity of these vibrations gave me sometimes a valuable method of determining the time-relations of the eye-movements under various conditions, but prevented an absolutely accurate determination of the exact form of the movements. The method therefore still remains crude. I have, however, by its use satisfied myself that spatial judgments are closely dependent on eye-movements and eye-positions, and that many geometrical optical illusions can be proved to owe their explanation to this fact. I have also discovered, I think, a new factor of influence in these illusions, — namely, the fact that the actual point of fixation of the eye is not always the one intended and thought to be fixated. If, for instance, when the endeavor is made to fixate the point of an arrow-head, the actual point of fixation falls within the angle, as my results seem to establish, then in the Müller-Lyer illusion the length of eye-movement is actually less in the case of the diagram that appears shorter. A fuller account of the results that lead me to these conclusions I must however reserve until an improvement in the method and further opportunity for research permit of their verification.

A few further details will be of value to those who may wish

to adopt and perfect this method. The eye should first be cocainized as above indicated. Then the lids should be propped apart by some form of eye-lid fastener, of which the best is probably that in form of a wide-opening spring with tortoise-shell grooves for the lids. The plaster cast may then be applied, with its opening directly over the pupil, and it will at once adhere firmly. If the amount of cocaine used has not been sufficient to interfere with accommodation, it will then be possible to see with the harnessed eye almost if not quite as well as with the other. The plaster will not detach itself until it becomes thoroughly soaked with tears. I have taken records for over an hour without inconvenience from its application or from the propping open of the lids. If it is desired to obtain release before it detaches itself, it cannot be pulled off without injury to the eye, but a few drops of water applied within its opening and to the eye around it will cause it to float off at once.

As to whether there is any danger to the eye to be feared from using it in this manner, I cannot say with assurance. I have myself always suffered a little temporary inconvenience due to the strain on the eye-muscles, to the affecting of the accommodation by the cocaine, and to the fact that a cast over an artificial eye never corresponds exactly to the curvature of one's own cornea, and the latter probably alters itself during the experiment to fit the cast. I have also found it necessary to allow a considerable interval to elapse between experiments, — usually a week. The unplesant effects have always soon passed, and now, a full year since my last experiments, I can detect no ill effect.

PRELIMINARY EXPERIMENTS IN THE PHYSIOLOGY AND PSYCHOLOGY OF READING.

By EDMUND B. HUEY, Fellow in Psychology, Clark University.

The present article is a report of experiments preliminary to a study of the Psychology of Reading, the general purpose of the study being to learn as far as may be just what occurs physiologically and psychically, in reading a printed page.

A series of experiments was first undertaken to decide the comparative merits of printing in columns of the ordinary width and in very narrow columns, with the belief that the speed-tests, etc., taken in this side problem, would be valuable and, especially, suggestive for the larger study yet to be made.

I. COMPARISON OF SPEED IN VERTICAL AND IN HORIZONTAL READING.

It would seem that in reading matter printed in sufficiently narrow columns the eye's lateral movement might be eliminated or nearly so, and the reading be done with one downward sweep of the eye. Among the advantages to be expected from such reading might be mentioned (1) the very great decrease in the work of the oculo-motor muscles; (2) the elimination of the asymmetrical change in accommodation, which Javal (*Rev. Scientifique, 1879,*) mentions as one of the main causes of fatigue in reading ordinary lines; (3) whatever advantage may be incident to having within the range of clear vision as much as possible of immediately related matter; (4) facilitation of the process of skimming.

I have confined myself to a comparison of speed, and have made the narrow columns contain but one word to the line, *i. e.*, having the center of each word just over the center of the next succeeding word.

Experiment A. There were printed on a Remington typewriter 15 lists of 50 words each in nonsense-arrangement, even similarity of first and last parts of words being avoided, and no two alike, in vertical column; and each list was also printed in ordinary horizontal fashion, but in reverse order of words, the lines being made a little shorter than the length of the columns, the type and other conditions similar in horizontal and in vertical lists. The first list contained only words of two letters; the second, words of three letters, etc., to and including a

list of 16-letter words. A list of 50 letters of the alphabet, in nonsense-arrangement, was added, with its reversed form as with the word-lists.

As the typewriter gave the same space to each letter regardless of the letter's form, all the words of a list were of equal length and both margins were straight.

The lists were read aloud by the subjects as fast as possible. The time was taken with a stop-watch marking fifths of second nominally, though tenths could be read from it. The readings were made as follows: The list of two-letter words would be read, *e.g.*, first in the horizontal arrangement, then in vertical; then in vertical again, then in horizontal; then horizontal of the 3-letter list would be read, and a similar order would follow. Care was taken to arrange the order of tests so as to eliminate the errors due to practice, etc.

There were thus two comparisons (two horizontal readings and two vertical readings) for each of the 16 lists. The four subjects tested are members of this University as are the subjects serving in other tests presently to be mentioned.

The results may be found in Table I.

It is interesting to observe that while the shorter words are read more rapidly in horizontal sequence, the longer are read more rapidly in vertical. Though the mean variations are large, the relation is so frequently repeated that it seems not wholly accidental.

Experiment B, 1. In this test the subjects read aloud as fast as possible a sense passage of 300 words, divided into 6 parts of 50 words each. The whole passage was printed in both horizontal and vertical arrangement. The lines of the horizontal arrangement were about two-thirds the length of the vertically printed columns.

Owing to the great difficulty of printing or type-writing words with centers in a vertical line, as half spaces would be needed for words of an odd number of letters, the arranging in vertical columns was done by hand, the words being cut from an exact duplicate of the horizontal copy used in the experiment and pasted on a background of white paper, the columns being placed as close to each other as the length of the longest words would allow. One reading of the passage was then taken, fifty words at a time, the first fifty being read vertically, second 50 horizontally, third vertically, and so throughout. Some days later, a second reading was taken, the parts read in vertical arrangement at the first reading being now read horizontally, and *vice versa*.

TABLE I.

Showing average times for reading aloud at maximal speed the same (nonsense) material in vertical and horizontal arrangements.

No. Letters		W.		C.		P.		H.		Av. 4 Subjects.	
		T.	M. V.	T.	M. V.	T.	M. V.	T.	M. V.	T.	M. V.
1	V	17.1	.3	16.5	.6	15.9	1.3	13.4	.8	15.7	.75
	H	15.8	.5	13.9	1.0	14.5	.5	12.2	.2	14.1	.55
2	V	18.1	.5	18.2	2.6	16.8	.8	15.8	.2	17.2	1.00
	H	15.8	1.0	17.5	1.8	17.3	1.3	12.0	.8	15.7	1.20
3	V	18.1	.8	17.3	1.8	15.5	1.1	15.3	.1	16.6	.95
	H	15.1	1.4	17.2	1.2	16.4	1.6	11.4	1.4	15.0	1.40
4	V	19.0	1.1	19.3	1.3	15.4	.6	15.3	1.3	17.3	1.08
	H	16.1	.3	19.9	.7	16.4	1.6	12.0	.8	16.1	.85
5	V	18.3	.8	18.7	2.1	14.1	.1	15.6	.6	16.7	.90
	H	17.0	.6	20.3	.3	15.9	1.1	14.1	.3	16.8	.58
6	V	17.6	1.7	23.4	3.4	16.3	.5	16.2	.4	18.4	1.50
	H	16.4	1.7	22.0	2.8	19.7	2.5	14.6	.8	18.2	1.95
7	V	17.7	1.4	20.8	1.8	17.1	.3	15.8	.4	17.9	.98
	H	15.2	.4	22.0	.2	16.1	.3	14.5	.7	17.0	.40
8	V	19.5	.7	21.2	.8	20.0	.8	17.8	.0	19.6	.58
	H	18.2	.7	25.3	3.5	20.1	.9	15.9	.3	19.9	1.35
9	V	21.1	.3	23.6	1.0	23.0	2.6	18.9	.3	21.7	1.05
	H	20.3	.2	25.2	4.2	20.8	1.0	18.0	.4	21.1	1.45
10	V	22.9	.8	25.5	.3	23.2	1.2	21.1	1.1	23.2	.85
	H	22.6	.6	27.0	3.6	22.7	1.5	19.7	.3	23.0	1.50
11	V	24.7	1.2	32.7	2.5	25:8	1.0	23.3	.7	26.6	1.35
	H	24.5	1.1	30.0	2.8	28.3	2.7	21.7	.3	26.1	1.73
12	V	28.5	3.3	33.1	.3	28.2	.6	24.3	.1	28.5	1.08
	H	25.9	.9	34.8	3.7	29.7	2.2	24.5	.9	28.7	1.93
13	V	28.9	1.0	35.2	.6	27.9	.3	26.0	.0	29.5	.48
	H	26.2	.5	39.3	7.1	30.6	.2	27.2	.6	30.8	2.10
14	V	31.9	.8	35.9	.3	34.3	1.5	32.9	.1	33.8	.70
	H	32.2	2.5	40.7	6.3	36.5	1.5	32.0	.8	35.4	2.78
15	V	37.0	1.6	55.8	4.2	40.8	2.0	38.5	1.0	43.0	2.20
	H	35.8	1.8	60.5	8.5	48.0	7.5	35.3	3.7	44.9	5.40
16	V	42.5	3.8	68.0	1.6	53.0	3.0	53.0	3.0	54.1	2.85
	H	44.5	1.7	69.3	5.1	59.7	7.5	59.7	7.5	58.3	5.45
Av. V.		23.9	1.26	29.1	1.56	24.2	1.11	22.7	.63	25.0	1.14
Av. H.		22.6	.99	30.3	3.30	25.8	2.12	21.55	1.20	25.1	1.91

The results for three subjects are as follows:

TABLE II.

Showing average time for reading sense passages in vertical and horizontal arrangement.

	VERTICAL.			HORIZONTAL.		
	Av. time per 50.		Words per sec.	Av. time per 50.		Words per sec.
	T.	M. V.		T.	M. V.	
P.	10.47	1.1	4.78	10.55	1.2	4.74
K.	14.40	.5	3.47	12.00	1.5	4.17
B.	14.13	1.9	3.54	12.00	2.0	4.17
Av.	13.00	1.2	3.93	11.52	1.6	4.36

Experiment B, 2. The same test was also made in a somewhat different form. This time the subjects read a sense passage of 323 words, aloud, as fast as possible, continuously, by one method (vertical or horizontal) and immediately read the same passage by the other method. The arrangement in vertical columns was as in the preceding experiment. After some days the reading was repeated, the order being reversed. Results for four subjects follow in Table III.

TABLE III.

Showing maximal speed of reading a sense passage aloud.

	VERTICAL.			HORIZONTAL.		
	Av. time for 323.		Words per sec.	Av. Time for 323.		Words per sec.
		M. V.			M. V.	
P.	75.05	6.0	4.30	75.3	2.2	4.29
K.	74.45	2.4	4.34	66.45	5.5	4.86
H.	62.10	1.9	5.20	59.1	.5	5.47
D.	109.00	11.4	2.97	99.90	5.1	3.23
Av.	80.15	5.4	4.20	75.19	3.3	4.46

Experiment C. This test was an exact duplicate of the preceding one, except that the reading was done silently instead of aloud. The subjects were directed to read it all, but by their own fastest method, and to pronounce the last word as a signal for the time-taker. Below are the results for five subjects:

TABLE IV.

Showing maximal speed of reading sense-passage silently.

	VERTICAL.			HORIZONTAL.		
	Av. Time for 323.		Words per sec.	Av. time for 323.		Words per sec.
		M. V.			M. V.	
P.	64.60	10.2	5.00	48.55	4.9	6.65
J.	121.80	6.2	2.65	83.70	0.1	3.86
K.	46.65	1.4	6.92	34.00	1.2	9.50
D.	65.15	6.7	4.96	31.40	3.1	10.30
B.	69.90	7.9	4.62	43.65	.15	7.40
Av.	73.62	6.5	4.83	48.26	1.9	7.54

In all these tests with words making sense the advantage is with the horizontal reading, but it is well to remember that the vertically arranged matter of all the sense-passages had been pasted on the page word by word; and in spite of all care the page presented an appearance more or less different from that of a neatly printed one. The distraction of attention incident to this, and to the vertical arrangement in general, would seem to be greater in silent reading, when no sound of the voice was present to help guide the attention and make visual distractions relatively unimportant. The smallness of the gain in speed in silent reading by the vertical method may be due to this, at least in part.

The enormous amount of practice in horizontal reading, which all subjects have had, must of course be taken into account in any such comparison. Subjects say they can easily read straight down with one downward sweep of the eye; but that they forget and use the old side-to-side method, taking, of course, more time with such short lines.

Then again, it is probable that the subject may have a greatest possible speed by one method and a greatest normal speed, or speed of comfortable and intelligent reading, by quite another.

Miscellaneous Observations. The readings furnished data of considerable interest aside from the immediate purposes of this comparison.

Rate for words of different length, for instance, in Table I dissyllables (6 letter-list) take but little more time than monosyllables (4-letter list) in reading aloud (18.2 : 16.1). A five-fold increase in length of words (3-letter to 15-letter lists) causes only a three-fold (15 : 44.9) increase in time; this, too, though the long words were much less familiar. Single letters are seen to take almost as much time as short words, as already observed by Cattell.

Effect of Practice. In Table V below is shown the time of first and eighth readings of some of the 50-word nonsense-lists. The first and eighth readings were by the ordinary horizontal method. Between these were four readings in reverse arrangement and only two in the direct, owing to the peculiar conditions of the experiment. It would seem, then, that the practice in word-order was negative, if anything; and that the increase in speed was due to increasing familiarity with the words themselves.

The test taken on myself, subject "Hu," indicates that there is a point beyond which further familiarity with the words does not very appreciably increase the speed. In arranging the lists and in the experiments I had become very familiar with every word; and this no doubt accounts for the constancy of speed.

TABLE V.

Time, in seconds, for first and eighth reading of 50 words in nonsense arrangement, at maximal speed, aloud and intelligibly.

	Single letters.		5-letter words.		9-letter words.		13-letter words.		Average.	
	1st R.	8th R.	1st R.	8th R.	1st R.	8th R.	1st R.	8th R.	1st R.	8th R.
P.	15.0	15.6	17.0	14.6	21.8	21.6	30.4	25.2	21.05	19.25
C.	14.8	11.9	20.0	18.4	29.4	20.8	46.4	29.4	27.65	20.12
W.	16.8	12.4	19.0	17.8	21.3	19.8	29.8	26.1	21.73	19.03
Hu.	12.0	11.6	14.4	15.0	17.6	17.4	27.8	27.0	17.95	17.75
Av.	14.7	12.9	17.6	16.5	22.5	19.9	33.6	26.9	22.10	19.05

Reading of Sense and Nonsense Matter. The speed in reading aloud was found to be closely correlated with the "sense" made, as might have been expected. Sense-passages were read in little more than half the time taken for nonsense-passages having an equal number of letters. There seems to be a *camaraderie*, as Egger calls it, among our words, and even among our phrases and sentences; and pronunciation of an adjective, for example, seems to subexcite association tracts representing substantives; — preferably and more strongly the substantives with which the particular adjective has been most often associated. Of these subexcited substantive tracts, some are still more excited by closer association with the general subject under discussion in the matter read. The right word, then, is ready to leap out at the slightest suggestion from the printed page, if that passage makes sense. If, however, it does *not* make sense; — if a preposition, *e.g.*, follows the adjective, the utterance of the former must suffer a loss of time due to lack of association in the past between adjectives and prepositions — there is no sub-excitation, to speak in physiological terms, of the organs for pronunciation of the preposition. Indeed, there is more than that; there is an interference of associations such as Bergström investigated in his card dealing experiment.[1] So in certain positions the substantive tends to arouse verbs, the preposition its related object, etc.[1]

II. COMPARISON OF THE IMPORTANCE FOR WORD RECOGNITION OF THE FIRST AND LAST PARTS OF WORDS.

A passage of sense-reading containing 456 words was printed in ordinary fashion, making a page of 43 lines, with considerable paragraphing. Several copies of this were obtained. From one copy the exact first half of each word was cut out,

[1] See *Am. Journal Psych.*, Vol. V, 356, ff. Art. on Experiments upon Memory.

letters being cut in half when necessary; and from another copy the latter half was similarly cut out. The arrangement is illustrated below:

ıy ures f ch ı eme? f is es ɔt eal o
ɔu, en ll ɔu dly, om ı re tical point,
ate he ıges ıd ɔrms st ıtly ded? ır
pose so bine ɛse ɛws, tically ıd wise, ıd
o nd a ıted py o ch ibutor.
he ɛms low ely gest ding ics. ect ɔse
ɔu re st ested n ıd ld ıy ers.

ar feat o su ɛ sch I th do nc app t
yc th wi yc kin fr ɛ mo pract stand
stɛ tl char ar refc mo greɛ nee Ot purp
i t com the vie statist ar other ar
t se ɛ prir co t ea contri
Tb ite bel mer sugg lead top Sel thc
yc ar mo inter i ar ad an oth

any features of such a scheme? If this does not appeal to you, then will you kindly, from a more practical standpoint, state the changes and reforms most greatly needed? Our purpose is to combine these views, statistically and otherwise, and to send a printed copy to each contributor.

The items below merely suggest leading topics. Select those you are most interested in and add any others.

Each page thus honey-combed, was fastened closely upon a white paper background. The page was then marked off into four divisions. Two readings were taken, separated by several days. The subjects read the entire passage at each sitting. At the first reading, *e. g.*, the subject would read the first division of the passage, with the first half removed; then the second division with the latter half removed, and so alternating. At the second reading he would read the first division with the latter half removed, then the second division with first half removed, and so reversing the order throughout. The passage used had not been read by the subjects previous to the experimental reading. The subjects were directed to read as fast as they could consistently with making as good sense as possible, but not to feel that they "had to hurry." They read aloud, the experimenter following the reading on a duplicate copy, and marking the words read correctly. The time spent on each division was taken with the stop-watch, the subject giving a signal when he reached the end of a division, never returning to correct mistakes. The first division contained 163 words, the second 125, the third 111, the fourth 57. Below are the results for three subjects:

TABLE VI.

Comparative importance for word-recognition of the first and last halves of words.

Subjects.	Part removed.	FIRST READING.					SECOND READING.					TOTAL, BOTH READINGS.				
		Time (in seconds.)	Words in passage.	Words read correctly.	Per cent. read correctly.	Words read correctly per second.	Time (in seconds.)	Words in passage.	Words read correctly.	Per cent. read correctly.	Words read correctly per second.	Time (in seconds.)	Words in passage.	Words read correctly.	Per cent. read correctly.	Words read correctly per second.
K	1st half ..	638	274	207	75.6	.32	361	182	144	79.1	.40	999	456	351	77.4	.35
	2d half...	427	182	159	87.4	.37	369	274	253	92.3	.68	796	456	412	89.9	.52
J	1st half ..	767	182	62	34.1	.08	836	274	168	61.3	.20	1603	456	230	47.7	.14
	2d half...	1113	274	189	69.0	.17	555	182	153	84.1	.28	1668	456	342	76.6	.21
V	1st half ..	423	274	219	79.9	.52	322	182	153	84.1	.48	745	456	372	82.0	.50
	2d half...	238	182	161	88.5	.68	332	274	253	94.9	.76	570	456	414	91.7	.73
Total	1st half .	1828	730	488	66.9*	.31*	1519	638	465	72.9*	.36*	3347	1368	953	69.9*	.33*
	2d half...	1778	638	509	79.8*	.41*	1256	730	659	90.3*	.57*	3034	1368	1168	85.1*	.49*

NOTE.— The starred numbers are averages from the vertical columns in which they stand, not recalculations from the totals to the left of each.

Among the factors that co-operate in this result may be mentioned (1) the tendency of English to place the accent on the first part of the word, the accented part tending to represent the word, at least the spoken word; (2) the preponderance of suffixes over prefixes, the main root of the word being in the first part, thus rendering the first part more important,

It seems probable also that the time-order in ordinary inter-association of syllables and other divisions of words has much to do with the difference shown. This time-order has almost always been from the first toward the latter part; and, as has been shown by various experiments, associations do not work nearly so well in reverse time-order.

III. Movements of the Eye in Reading.

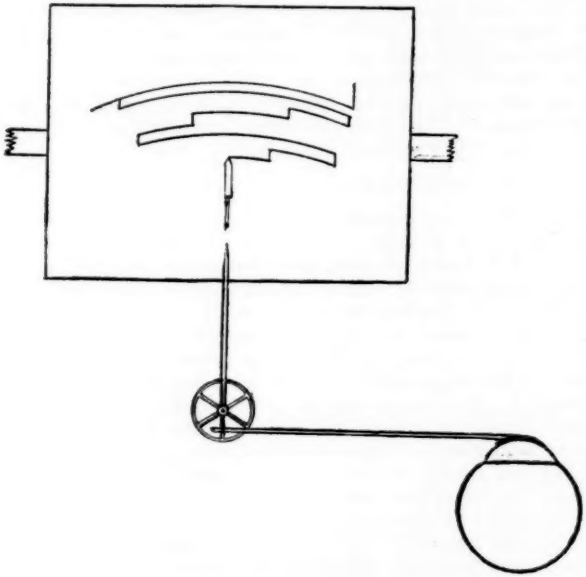
By watching the eyes of subjects while reading matter such as a page of this JOURNAL, I found that I could always tell them, at the end of a passage, just how many lines they had read, despite their subjective notions that their eyes did not sweep along each line. By having the subject read aloud and noting the syllable pronounced just as the eye turned for the return sweep, I found that I could get the approximate distance of the eye ahead of the pronunciation, for at least one point in the line.

Besides, the most casual observation showed that the eye moved along the line by little jerks and not with a continuous steady movement. I tried to record these jerks by direct observation, but finally decided that my simple reaction to sight stimuli was not qnick enough to keep up with them when the subject read at normal speed.

It seemed needful to have an accurate record of these movements; and it seemed impossible to get such record without a direct attachment of recording apparatus to the eye-ball. As I could then find no account of this having been done, I arranged apparatus for the purpose and have so far succeeded in taking 18 tracings of the eye's movements in reading as many passages consisting of from 9 to 30 lines each, in different sizes of type and with lines varying in length from 21 mm. to 120 mm.

The apparatus consists essentially of (1) a frame for fixation of the head, fastened between iron standards which are clamped to a heavy table; (2) of a light recording arrangement, resting on the top of one of the standards, connecting by a light celloidin-covered glass lever with a cup capping the cornea, and writing its record on the smoked drum of a kymograph by means of a celloidin-tipped tubular glass pointer, (below is a somewhat simplified horizontal plan of the arrangement for recording); (3) of an electric time-marker wired to a clock

marking quarter-seconds, and writing its record on the drum just opposite the record of eye-movements; (4) of a holder for the reading matter, arranged to slide on a track bearing a scale of distances measured from the front of the cornea.



A permanent fixation of the head with reference to the recording apparatus and reading matter is obtained by having the subject bite into a mass of partially cooled sealing-wax attached to a mouth-piece fastened in the head frame; the imprint of the teeth being preserved when the wax hardens.

The cups used for attachment to the cornea were made by casting plaster-of-Paris over either a carnelian marble or a steel ball having a radius of curvature a very little less than that of the cornea. The outer surface of the cups was sand-papered until quite thin and light and a hole was drilled through the center, of a diameter of 1.7 mm. The cup has been placed on the left eye, in experiments thus far.

As may be seen from the diagram above, there was no weight on the eye but that of the cup and short lever directly attached to it; and the work of the eye-muscles needed to run the recording-apparatus is almost imperceptible in actual reading.

The eyelids are kept separated and the subject prevented from winking by lead fingers fastened to the head frame and pressing sufficiently upon the skin above and below the eye.

The eye was rendered anæsthetic by the use of cocaine. Beyond the dilation of the pupil (corrected by the cup acting as a diaphragm), and an occasional interference with accommodation, the normal action of the eye seemed to be in no way interfered with.

In beginning each test the eye was fixated on the left end of the first printed line, or of two or more parallel ink lines drawn above this. When the kymograph had attained its proper speed, at a signal from the assistant, the eye was moved along the line and fixated on the other end, then back, and so on, back and forth for from two to five lines before the reading began. This was done to furnish known bases for comparison with the later curves. The curves show no interruption from end to end, until the reading begins. Then, however, the curve is not only *always* interrupted by the eye's several fixations, but is always shorter than the curve representing the lines whose ends were fixated, showing that the eye does not travel the entire length of the line in reading.

In some of the tests the ends of the last two lines were fixated also, and probably this will be found most convenient for purposes of measurement. By reading the same matter at different distances from the eye, the number of jerks was shown to be a function of the matter read rather than of the arc described by the eye's rotation.

A series of eight tests was taken with special reference to determining what function the lateral movement of the eye is of the length of the line, and with what width of column the lateral movement may cease and the reading be done with one downward sweep of the eye. The passages used were cut from *Munsey's Magazine* and the *Cosmopolitan*, and were in their ordinary size of type, with lengths of line varying between 21 and 120 mm.

The tests show at a glance that the lateral movement decreases much faster than does the length of the lines and that at 21 mm. the reading may be done without lateral movement, though this is still apt to occur, probably from habit.

By the help of the quarter-second record written on the margin of the paper, it is possible to measure approximately the time during which the eye remains fixated at each point, but the unit is too large for getting the speed with which it moves from one fixation point to another.[1] The latter point is espe-

[1] A promising attempt has been made to measure this by means of the spark method of time recording.

cially interesting, as it would seem from the curves that the speed may be so great that the retinal impressions fuse and that we really do not see foveally what we read except at the few points on the ordinary line at which the eye pauses. These experiments are as yet incomplete; and the data which they furnish cannot be arranged in time for this report.

For the suggestion of making a direct attachment to the eyeball, I am indebted to Dr. August Ahrens[1] who reports making a firm attachment of an ivory cup, but failed to record the movements. I am told that cups of glass have also been attached, in ophthalmological practice. I am also indebted to Prof. Delabarre for the suggestion of plaster-of-Paris as a most convenient material, and this has been used thus far, ivory cups being rather troublesome to make, while the plaster-of-Paris is easily workable.

No trouble was experienced in getting the cup to stick for as long as was desired, when the lids were kept well separated; indeed, it was somewhat difficult to remove it on several occasions. The experiments have so far been made on but two subjects — Prof. Hodge and myself. I am especially indebted to Prof. Hodge, as it has been difficult to get subjects; partly from an exaggerated notion of the danger to the eye, partly from the defective vision of those who were otherwise available.

[1]See his "Die Bewegung der Augen beim Schreiben," Rostock, 1891.

ON CHOICE.

By Caroline Miles Hill.

The person who has not, at some time or another, realized that choice is a problem, is certainly an exception. Most of us must confess that upon some occasion we have retired to our closets and there tossed up a penny to get rid of a troublesome decision. It is a matter of common observation also, that for two classes of persons choice is very difficult and sometimes impossible for those absolutely ignorant of the relations and consequences of either of two courses of action, and for those who know the arguments to both sides of the question and have no prejudices to consult. A child is often more annoyed and disturbed by being urged to decide something for itself than by any amount of compulsion. It is nothing unusual to hear an ignorant and vacillating individual say he does not care which of two alternatives he accepts, nor is it unusual to hear the wise and resolute person say that in view of all the facts to both sides, it is next to impossible to say which group should be chosen. If only "*once* to every man and nation," came the "moment to decide," choice might not be a psychological problem worthy of investigation, but when it comes daily in some form, often so predetermined that it does not rise into consciousness as choice, again so much influenced by its fringe of relations to other things that it is called a dilemma, it is clearly a mental act subject to natural laws, which may be assumed to be the same for all kinds of choices. Choice comes to the American nation at least once in four years, and every newspaper in the land considers itself capable of setting forth the natural laws which have determined the nation's choice. Self-interest on the one hand as over against the good of the whole nation, or habit or conservatism, or discontent or what not. The individual thinks he understands the reasons for his own decision on any difficult case, but the motives seen by his "candid friends" are often very different from the ones which he assigns to himself.

The ready answer of the cynic to the question, what causes the difficulty in choosing? would undoubtedly be, choice is difficult where the line of self-interest is not clear. The answer of the psychologist is stated in almost the same words. James (Smaller Psychol., p. 170) says that choice follows attention, and attention interest. Dewey, giving the interpretative side, says that we choose that in which we are best able to find ourselves, our experience determining with what we can identify ourselves. The whole difference in the two types of answers is in the content of the term self-interest.

Viewed historically, the question of choice is, what, in Greek times, determined whether a man should be a Stoic or an Epicurean? At the time of the Reformation, what made a man a Lutheran, a Calvinist, or a Zwinglian? Later, what tipped the balance in favor of the Tories or the Whigs, the Puritans or the Dissenters? And so on through all the strifes and factions that have divided mankind. Because the tenets of the one side or the other seemed more rational? Rationality, so-called, involves habit, suggestions from friends, influence of surroundings, as well as so-called argument. In fact there are no absolute and abstract arguments, all are personal and concrete. Separating out

the elements so far as they are known, there remains always at bottom one insoluble factor; temperament determines very largely which belief shall seem more rational to any individual, and temperament is, at bottom, a physiological problem.

Any study of choice, then, must be a study of different elements and of their importance and relations to each other, but before this can be attempted there is need of a physiological base line from which to reckon. If we could find some choices absolutely free from thought associations or from calculation of consequences, the unconscious or physical elements might be discovered. There are some suggestive cases where physical force seems to hold us back from a decision which reason recommends. Often we find that obedience to this instinct was very wise.

The practical and ethical bearings of the general problem give it so great an attractiveness that an attempt was made to treat some aspects of it experimentally. The results, though meagre, have a certain interest in themselves; and as their further development by the writer has become impossible, she ventures to give them as they are, hoping that they may prove, if not an assistance, at least a warning to any who may be tempted in the same direction.

In view of the complexity of the problem of choice and of the necessity of eliminating as many of the conscious factors as possible, a few trial experiments were made. In order to find an approximate answer to the question, what conscious motives will influence a choice between two things differing very slightly?

1. A series of sets of two nonsense syllables of three letters each, in which two letters were different (*e. g.*, rab and vab, hib and gib), was shown to a class of twenty-four young women, who were asked to write down one syllable of each set. When the series was finished they were asked to write any conditions which might have influenced their choices. Result: 12 said they chose the syllable which seemed nearer, 5 chose the left because it was natural to begin to read with the left hand, 2 formed an association at once with one of the syllables, and thus the choice seemed to make itself, 3 said they thought they had made up their minds before they opened their eyes, 2 could not give any reason.

2. Two different letters were shown in the same way. Result: nearness was assigned as a reason in 6 cases, habit of reading in 5. Three new reasons were mentioned,—7 made choice of one letter simply because they had chosen the other before, 5 wrote the one which caught the eye first, 2 chose one because they preferred its form to that of the other, while 9 could give no reason.

3. Next, two circles having the same radius were shown. Result: 9 chose the one which seemed nearer, 7 the left from the habit of reading, 1 no reason.

While the method used in these preliminary experiments was very crude, and the results could not be relied upon as of any scientific value, they seemed to indicate something worth thinking about in forming an hypothesis, *i. e.* The three trials had been made with objects successively simpler, an association was formed only with syllables, and an æsthetic preference was noted only with letters. With letters the motives were less conscious, since 9 were unable to say why they chose one rather than the other; with circles the motives were practically two: "nearness" and habit. Hence, it would seem desirable to plan an experiment in which choice from æsthetic preference should be impossible, and one in which no associations were involved, while the line of investigation indicated seemed to be to measure the force of habit, and to find the meaning of the "feeling of nearness."

The second attempt to find the elements and their proportion is the private history of a campaign that failed, but may be worth mentioning briefly.

Method: A black semi-circular screen was now made, placed on a table covered with black. A black cloth was thrown over the top and a window cut in the middle of the screen. The subject sat in front of this window, with pencil and paper lying on the table. Pairs of gummed letters and figures which had been stuck on white card board were slipped into this window from behind the screen while the subject's eyes were closed. At a given signal he opened his eyes, looked at the window during four beats of the metronome (or four ticks of the watch), and closed them for an instant at another signal, opening them to write one or the other of the letters on the paper. The purpose of this procedure was (1) to find what is the normal proportion of right hand to left hand choices, and (2) what the conscious motives for choosing the right hand or left hand objects are, (3) whether unconsciously the proportion of right to left choices could be influenced by attracting the attention to one side or the other.

Each series of pairs of letters and figures was shown three times, once with something to attract the subject's attention to the right or to the left, *e. g.*, a scrap of red or blue paper, or a person standing on one side or the other, but within the subject's field of vision,—and once without any such stimulus.

Result: (1) without stimulus. The proportion of left hand to right hand choices (118 trials) was, in round numbers, 4 to 7; (2) with the attention attracted to the left hand side by some means, the proportion became 4 to 6 (93 trials); (3) with the stimulus on the right, and another set of subjects, the unexpected ratio of 7 to 4 in favor of the left was found. Upon inquiry it was found that one of the subjects always chose left, and another was never led by anything except associations.

This set of trials was made in the Harvard Laboratory in the winter of '94-5. They seem to indicate a slight influence of attention upon choice when the persons had no fixed habits or permanent associations. A year later, the same experiment was repeated at the laboratory of the University of Chicago, with the assistance of Miss Helen Thompson. The results obtained here were only negative and the experiments seemed to arouse in the subjects the same feeling of annoyance which the child feels when he is told that he may do just as he pleases, but *must* do one of two things, neither of which has any meaning to him. Geometrical forms and kindergarten sewing cards were used, as well as the letters and numbers, but the number of right and left choices was almost exactly the same, and the use of a stimulus seemed to make no difference at all. There are three probable reasons why this method brought no results:

1. The adult cannot choose absolutely unconsciously.
2. So far as he is conscious he is not likely to know certainly what influenced him.
3. The results favorable to the hypothesis that attention is the decisive factor in choice may be due to accident.

Another simple experiment was decided to contain more nearly the elements of natural choice, *i. e.*, a decisicn which resulted in action involving consequences. Two playing cards were turned faces down, on a bare table at which the subject was seated. He was told to close his eyes while the cards were being placed, open them at a signal and turn one of the cards over. An attempt was made to render the subjects unconscious by telling one class, those in the laboratory, that this was a way of telling fortunes with cards, the observer

making up a story from them as they were turned. Two other classes of subjects were used, (1) adult persons outside the laboratory who were entirely innocent of psychology, and (2) children from the kindergarten. The former class were told that it was a psychological experiment, which, I am sure, conveyed very little information to them, and the children that it was a game which I wished them to come to my house and play with me, I being very fond of children and games.

Result: (1) adults in laboratory, 172 trials; 79 left choices, 93 right, or about a proportion of 5 to 6. (2) adults ignorant of psychology, 178 trials; 87 left, 91 right, or about 12 to 13. (3) children between four and six years. (a) kindergarten sewing cards, 49 trials; 17 left, 31 right, or about 1 to 2; (b) playing cards, 223 choices from 15 children; 54 left, 160 right, or 1 to 3. None of the children were younger than four years, 5 were about six years. The choices of the elder five were: total, 87; left 28, right 59, or about 1 to 2. The choices of the ten about 4 or 5 years were: total, 136; left 26, right 101, or 1 to 4. The children about 6 tend to hesitate and deliberate more than the younger ones, with one exception. One little girl of 4 years always deliberated, and of her 11 choices, 4 were left and 7 right, or the same proportion as the older children.

From these results one is certainly safe in concluding that natural, physical choice, seizes upon the object nearer to the reader's hand. This is seen in both right and left-handed children. The desire for variety is probably indicated by the one-fifth of the younger children's choices of the left hand card.

With these conclusions for a basis, another simple experiment was planned to find the influence of attention upon the normal ratio of right to left hand choices.

1. Cards of two sizes were taken, ladies' and gentlemen's visiting cards, and placed side by side.

Result: (a) larger card to right; 123 trials; left 40, right 83, or 2:1,—the same as the normal ratio. This was tried with 13 children. If we throw out the choices of one boy who said he liked the smaller card better, and of one girl who seemed to have fallen into the habit of choosing the left card, and kept on choosing it automatically, the result stands: total, 114; left 35, right 79, or a slight increase in the proportion of right-hand choices.

(b) Larger card to the left.

Result: left 30, right 69; total, 99.

2. Cards of the same size with a red or blue spot on the right one.

Result: total, 37; left 7, right, 30, or 1:4, double the normal ratio.

3. Cards of the same size with a red or a blue spot on the left-hand card.

Result: total, 130; left 55, right 75, about 1:1½, or a decrease of the normal ratio, but not so much as the additional stimulus on the right is able to increase the normal ratio.

Three children apparently thought only of seeing the other side of the card as soon as possible, seized the card nearer the right hand and were not influenced by the spot.

Not counting their records, the result would stand: total, 161; left 57, right 104, nearly 2:1, or a reversal of the normal ratio.

4. 51 trials were made with cards exactly alike, arranged so: [b] [a]

Result: left 30, right 21.

This, so far as it goes, corroborates the conclusion that it is natural to choose the object nearer, when the choice is uninfluenced by any other consideration.

The general results are so simple as hardly to need summarizing, the most important, perhaps, being the extreme complication of the phenomena to be examined.

PSYCHOLOGICAL LITERATURE.

Methodologische Beiträge zu psychophysischen Messungen, auf experimenteller Grundlage. Von A. WRESCHNER. Schriften der Ges. f. psych. Forschung, Heft 11. Leipzig, J. A. Barth, 1898. pp. vi, 238.

This volume contains the record of an elaborate series of experiments with lifted weights, and of minor series with visual distances and temperatures, together with a detailed discussion of results from the point of view of psychophysical methodology. It is with the weight experiments that we are here chiefly concerned.

(1) *Method.* The experiments fall into two main classes. In the first, 15 standard weights were employed, lying between the limits of 200 and 8,000 gr. Each of these was compared with as many variable weights as sufficed to bring out judgments ranging from "much greater" to "much less." The variables differed from their standard by 0,05 P or some multiple of 0,05 P (P = standard weight). An experimental series ("double series") consisted in the comparison of a given standard weight, twice over, with as many variables as were required for certain judgments of the kind just mentioned: the order of presentation of the variables was determined by lot. Each series was taken in a constant time order (P I = standard first, P II = variable first), and was immediately followed by a second series in the reverse order. On the average, 10 smaller and 10 larger variables were used in every series. The method was without knowledge: we return to the point later. The author served as subject in 12,000 experiments of this kind (20 experiments for each of 20 double series with 15 standards). A control group contains 2,400 experiments.

In experiments of the second class, the standard remained constant at 2,000 gr.; the variables were graded as before. The experiments were not confined, however, to a single lifting of each weight. The first weight of the experiment, standard or variable, according to the time order of the series, was lifted once, twice, thrice, four times or five times; then, the second weight lifted once; and then, the judgment of comparison passed. The author has at his disposal, as principal material, 4,000 experiments (800 of each of the 5 groups). Control groups contain 2,000 and 1,600 experiments respectively.

Experiments were also made with varying interval between lift and lift, each weight being lifted once. The standard was constant at 2,000 gr. (pp. 19, 128).

All experiments were performed with a specially constructed apparatus, in which a padded bracelet pulled up a weighted string over rollers. The position of the elbow was kept constant, and the hand (save for its weight) had no influence on the experiment. The judgments classified were "equal," "less," "greater," "much less," "much greater." Intermediate judgments ("equal or less," "equal or greater," "nearly much less," "nearly much greater,") are regarded by the author as good categories, but played a very small part in actual practice. They are counted with each of the chief judgments upon which they border, and these themselves doubled.

(2) *Evaluation of results.* If P is compared with a series of

(smaller and larger) weights, and these differ but little from term to term of the series, we shall get a number of variables that give the judgment "greater," a number that give "less," and a number that give "equal." The number, in each case, represents the "range" of the judgment in question. By determining the upper and lower limits of range—the variable weight which is "still" or "just" judged so or so—we ascertain its relation to the heaviness of the variable weight, its "quality." If the experiments are numerous enough, we find one variable weight which is most effective to call forth a particular judgment: the opposite of the limiting weights, which are least effective. So, with our variable series for abscissæ, and the number of judgments of a given category for ordinates, we obtain a curve of two branches, rising continuously to and falling continuously from the maximal value (*cf.* Gauss's law of error).

These data must be turned to account in as many ways as possible. In the first place, we notice that the curves show the "reliability" of a judgment under varying conditions. The maximal value of the greater curve, *e. g.*, indicates the variable weight with which the greater judgment is most reliable; its limits indicate those with which the judgment is least reliable. Secondly, we can learn something from them about sensible discrimination. It is clear that sensible discrimination may vary with equal degree of reliability: the maximal value may rest on the same number of confirmatory judgments, but these hold of different variable weights. Sensible discrimination is best represented by the central value, *i. e.*, the arithmetical mean of all judgments of a given category. The central value shows what variable weight has the greatest likelihood of calling out the judgment in question. Thirdly, we can ascertain the clearness or distinctness of the division between the various kinds of judgment by comparing the ascending and descending branches of each curve; the branches of the greater curve, *e. g.*, border on "much greater" and on "equal;" those of the equal curve upon "greater" and "less," etc. Lastly, it is well to fractionate the experiments, first into the two sub-groups P I and P II, and secondly into minor groups according to the date of working (variation of disposition from day to day, course of practice, etc.).

(3) *Mutual relation of the three kinds of judgment, "greater," "equal," "less."* Those who have worked with the method of r. and w. cases know that several kinds of judgment are possible. Besides the judgments "greater" and "less" there occur the judgments "equal," "equal or greater," "equal or less," and "doubtful." Doubtful cases must be thrown out; they depend upon lapse of attention, upon disturbance by surprise, upon variation in the impression made by the stimulus during its course, etc., etc.[1] The intermediates we have dealt with under (1). The equals have been a source of dispute. Kraepelin, Jastrow, Fullerton and Cattell, Higier, Löwenton require their subjects to make a guess at difference in every experi-

[1] Fechner halved them, distributing half to the greater, and half to the less judgments. *El. d. Psychophysik*, I. 72; but *cf.* G. E. Müller, *Grundl.*, 40 ff. See also Müller and Schumann, *Pfl. Arch.*, XLV. 40; Wreschner, 12. Some writers would distinguish between the judgment "doubtful" (*i. e.*, either equal or different) and the judgment "different" (with doubt whether greater or less). Külpe ascribes the latter to a "reproduction of the general;" the wider concept of "different" is released more quickly than the narrower concepts "greater," etc. *Outlines*, pp. 68, 73, 172 *f.*, etc. But while we may grant this as a law of reproduction, we do not need it for the "different" judgments in the method of r. and w. cases. Such judgments are probably due to the concurrence of extraneous differences with equality in respect of the attribute under investigation: Meyer, Zeits., XVI. 360. They should, therefore, be thrown out, and the experiment repeated.

ment, so that the judgment of equality is never recorded. Sanford, too, favors the "simpler form" of the method.[1]

It is regrettable that difficulties of mathematical treatment should have led to what Ebbinghaus has rightly termed a "Vergewaltigung des Urtheils;" and it is one of the chief merits of the present work, on its methodological side, that it bears out the protest against "simplification" already urged by Merkel, Külpe, Ebbinghaus and Wundt. Dr. Wreschner is able to state definitely, on the basis of the various forms of evaluation given under (2), that "there can be no question but that the judgments 'less,' 'equal,' and 'greater' belong to sharply differentiated *(genau charakterisierte)* judgment categories." His method, which is wider than that of r. and w. cases, allows him to say the same thing of the judgments "much greater" and "much less."

The rest of this section may be summarized as follows: Reliability of judgment is greatest for "less," least for "equal;" sensible discrimination is greatest for "less," least for "greater." Reliability is greater, throughout, in the ascending branch of the curve than it is in the descending; sensible discrimination is greater in the descending branch for "less," in the ascending for "equal" and "greater." "Less" is more clearly distinguished from "equal" than from "much less;" "equal" more clearly from "less" than from "greater;" "greater" more clearly from "equal" than from "much greater." The remainder of the chapter is concerned with the form of the various curves.

(4) *The time error.* The first question to be considered is the question whether the judgments of P II can be reversed ("greater" written as "less," and *vice versa*) to bring them into accord with those of P I. Careful comparison shows that all the characteristics of the two judgment categories, as established under (3), manifest themselves for both time orders, when the reversal of the P II judgments has been made. The psychological reason is that, in the judgments of P II, the memory image of P dominates the subject's mind as soon as P has once been given (second lifting of first experiment)—so that judgments which have the "greater" form are, psychologically, "less" judgments, and *vice versa*. It is always the variable that is judged in relation to the standard, no matter whether standard or variable be given first. Hence any differences between the P I series and the reversed P II series must be put down to the altered time order, and not to differences in the mental mechanism of judgment. We have material for the investigation of the time error.

This analysis is exceedingly important from the point of view of the author's method. Were the subjects told the time order of the first double series or not? Presumably not, since the procedure at large was procedure without knowledge. Suppose, then, that the morning's work begins: chance decides what variables shall be given in the first few experiments. How is the subject to know his standard? There must be a number of initial experiments, varying as the occurrence of mean or extreme variables varies, during which the identification of the standard is impossible. The assumption that these judgments belong to the P I order (in a P I series), and their reversal from the P II to the P I order (in a P II series), cannot be justified. Of course, the knot is cut, if the subjects were acquainted with the time order in every case; but this is nowhere stated.

In either event, a more general criticism may be passed. Is "absolute" judgment in the P II series—judgment of the weight first given in terms of a memory of P, and confirmation by the appearance

[1] Course, pp. 353 ff.

in perception of P itself—is absolute judgment of this kind, which is regarded as a bad experimental habit in the method of r. and w. cases, a form of judgment which it is worth while to introduce in weight experiments by any method? The matter cannot be discussed in detail here. We may, however, note that the part played by the memory image in these experiments must of necessity dispose the author to that psychological theory of the time error which he later adopts.

The results of the chapter are summarized under six heads as follows: 1. The time error has a twofold character; it may be positive (first weight heavier) or negative (second heavier). *a*. Granted a certain degree of practice, it is of greater negative (or lesser positive) value for the smaller variable weights than for the larger: without practice the reverse obtains. *b*. It is positive with the smaller, negative with the larger standard weights. *c*. Continuance of practice changes it (especially with the larger variable weights) in the positive direction. *d*. Fatigue changes it (especially with the larger variables) in the negative direction. *e*. Increase in the distinctness of the memory image of the first lifting changes it in the positive direction. *f*. Within certain limits, increase of time interval between liftings changes it in the negative direction. 2. The magnitude of the time error is variable. *a*. With all variable weights, it is larger, the more remote the variable from the limits and maximum of the judgments "greater" and "less." *b*. Practice reduces it. *c*. Granted a certain degree of practice, the smaller variables have a larger time error than the larger: without practice the reverse obtains, as it does also under all conditions with small standards. *d*. The time error is smallest with moderate, greatest with very heavy, and moderate with small standards. *e*. In experiments on visual distances and temperatures, the negative value of the time error is less when the standard stimulus is on the left hand side. 3. Sensible discrimination is greater for P II than for P I; "less" is the only exception to the rule. 4. Reliability of judgment is greater for P II than for P I; "less" is, again, the only exception. 5. The time error obtains in very various sense departments (sight, hearing, temperature sense, "muscle" sense). 6. It appears in the two-handed as well as in the single-handed procedure.

It has already been said that the author adopts the psychological (memory image) theory of the time error, as contradistinguished from the physiological (after-effect of first stimulus). He does not, however, deny that fatigue, etc., may have something to say in the matter. The twofold character of the error he explains by the generalizing and schematising tendency of memory, as compared with perception; we have a positive error, a negative error, or no error, according to circumstances.

(5) *Practice.* The theory of practice is considered under the three heads of apprehension of the two weights, estimation of their relation to each other, and retention of the first impression in memory. It is noteworthy, in the latter connection, that the weight first raised appears heavier to the practised than to the unpractised subject: especially is this the case when the variable weight is lifted before the standard. The blurring, weakening effect of memory is thus compensated (pp. 208, 211).

(6) *Weight of the standards.* As was to be expected in an investigation of this kind, there is no direct and unimpeachable evidence of the validity of Weber's law. With constant relative difference between stimuli, it was found that reliability of judgment, sensible discrimination, and separation of the judgment categories improved with increase of absolute weight (limits 200 and 8,000 gr.). On the other hand, the effects of practice and of the time error must not be forgot-

ten; and the author's conclusions square pretty well with those drawn by Fechner (*Elem.*, I, 199) and Müller (*Grdl.*, 225).

Dr. Wreschner may be heartily congratulated on the accomplishment of so thorough and comprehensive a piece of work. The criticisms passed above must be taken as suggestions only; the true test of an experimental enquiry lies in its fruitfulness for further research, and its stability in face of new results.

E. B. TITCHENER.

Etudes d'Histoire de la Philosophie, par E. BOUTROUX. Alcan, 1897.

The first chapter of Mr. Boutroux's "Etudes" treats of the conception of History of Philosophy. He does not think that the philosopher as a man ought to be dealt with; nor does he consider the study of special treatises on some topic or other, the object of History of Philosophy. Only in case we find in the writings of a thinker the elements necessary to truly constitute a system of philosophy, need we consider him as forming a part of History of Philosophy.

Two essays, the one on Aristoteles, the other on Kant, are reprinted from the *Grande Encyclopédie*. They bear the mark of such works; they are destined to be read by the public in general, and they therefore contain only the absolutely necessary amount of philosophy; they are of no interest to the specialist.

The study on Boehme is entirely different. With the skill and clearness particular to French thinkers, Boutroux is most successful in extricating the rational element of the thought of Boehme, from the mystical form in which it is enveloped, and he succeeds in presenting a thorough and systematic statement of this philosophy, which is no easy matter. The author points out that the speculations of Boehme are very nearly the same as those of the later German metaphysicians — Leibnitz, Kant, Fichte, Schelling, Hegel, Baader, etc., although he presents them in a different form; and the former fact explains the name of *philosophus tentonicus*, which his friend Dr. Walther justly gives to Boehme. Upon reading Boutroux's work, one has the impression of encountering solid reasoning. And yet it seems to me that he is not entirely right. For not only does one meet with the speculations of Boehme in the works of German metaphysicians, as Boutroux says, but also with metaphysicians of all times and of all countries.

There are but few metaphysical interpretations of the world. They are generally ranged in three classes: pantheism, theism and materialism; and each kind of pantheism has only very few features differing from some other kind of pantheism, just as every kind of theism is akin to other theisms, and one materialism is akin to other materialisms.

Considered in this light, the argument of Boutroux loses a great deal of its value. The only outcome of his reasoning is, that, if the metaphysical speculations of Boehme seem more like those of German thinkers than of thinkers of other countries, it is because German thinkers are more apt than others to devote themselves to metaphysical speculations.

It often happens—and such seems to be the case here—that, in studying the works of a man, we gradually become fascinated by him and consider him more important than he really deserves. This is an error of which Boutroux became guilty, both in treating Boehme and in his examination of the influence of Scotch philosophers on French thought. It cannot be denied that this influence exists; Reid, Dugald Steward, Brown were thinkers of the same stamp as

Royer, Collard, Cousin and Jouffroy. But, in reading Boutroux, one would have to believe that in the XIX century, very few, except the Scotch and Eclectic philosophers have had any influence. Boutroux preserves a most astonishing silence as to German, and especially Kantian, influence. It may be said that this does not pertain to his subject. Be it. But Boutroux has attributed so much in French philosophy to Scotch influence, that if he were now to write an essay upon German influence on French philosophy, he would find that he has left none to assign to the philosophers of that country. Not only does Boutroux completely ignore Kant, but he goes so far as to make Hamilton a pupil of Reid; and, what is worse than all else, he claims that Renouvier, the head of the New *Kantian* School in France, is a follower in philosophy of Hamilton.

Another striking example of the method of our author is this: According to Boutroux, A. Comte is a production of the Scotch School, *because* he considered Hume his most important precursor. How could a man like Boutroux apparantly forget that the part of Hume's philosophy adopted by Comte, was exactly that part of his doctrine against which the School of Reid fought with might and main?

Finally, a few words on the essay on Socrates. It is the best thing ever written on this philosopher that I know of. The author discusses the opinions of prominent thinkers on Socrates, especially Schleiermacher, Zeller, Grote, Fonillée.

The most important theses attributed to Socrates by Boutroux are as follows: The object of his thinking is True Happiness in opposition to apparent bliss. He finds this happiness in virtue. The art of doing right has to combine itself with, or rather is based upon, the science of doing right. To attain this end, all science must be concentrated in ethics. Physics and metaphysics are treated by him only for the sake of ethics. Socrates's great merit consists in having established a science of ethics.

The basis of science—which our author considers synonymous with ethics—is the "General." This word, we are to understand, means: What everybody thinks, what is the common fund of thinking of all men. There must exist something of this kind, since men can understand one another by means of language. In order to find out what this "General" is, one must speak with ordinary men, which, as we know, Socrates did. His method of teaching was the dialogue.

The result of his researches in the domain of science of ethics, is: Self-control is the greatest virtue. Socrates is not the good-natured man we often believe him to be; his actions seem to spring from a source of goodness, but his end was only his own perfection, not the relief of the suffering of others. His main object is to discipline himself.

See especially pages 83-84, too long to quote here.

ALBERT SCHINZ.

Scipio Sighele. Psychologie des Sectes. Traduction de L. BRANDIN. Paris, Girard & Brière, 1898. Bibliothèque de Sociologie Internationale.

Introduction. With the progress of civilization, crime has changed its character. With savage peoples it was gross and brutal; it has now grown more and more crafty and refined, it has become intellectual. This is not only the case with individual crime, but also with collective crime. The author claims the honor of having introduced the study of two kinds of crime in regard to collective bodies, such as crowds, sects, classes, etc.

Chapter I. There are different kinds of crowds, ranging from the heterogeneous crowd to the organized State, which is the supreme and most perfect form of homogeneous crowds, reached by the intermediate stages of theater or concert goers, clubs, jurors, parliaments, sects, castes and classes. The prominent feature of the *sect* is that they have some faith, religious or politic, in common, that of the *caste* is a common profession, and that of the *class* common interests.[1]

Chapter II. The individual is always influenced by the circle which surrounds him. The member of a sect is influenced by an idea in which he believes. The sect becomes a party when the idea has gained a sufficient number of partisans. The difference between a sect and a simple crowd is, that a crowd uses only violence to attain its ends, while a sect employs craft. A sect always has a leader *(meneur)*, which leader, however, is led *(mené)* in his turn by the idea he fights for.

Chapter III. There are different kinds of morality, individual and social, the morality of family, of country, etc. Among others also the morality of sects and politics. All of them are either morality of love or of hatred, and have their origin in the instinct of preservation.

Chapter IV. Man as an individual is far more moral than man as a social being. The long discussion upon the legitimacy of a morality of hatred, which the social man holds, remains without result. On page 174 the author says: "Everybody admits that ideal politics would mean honest politics. But could such politics be ingenious *(génial)* at the same time, and thus useful and fertile? Can you imagine a diplomacy which would be great without lies? A government which would be strong but void of despotism? A sect succeeding without violence of some kind? Neither in the past nor in the present do we find such examples. As for the future it seems doubtful."

One sees to what solution the author inclines; however he appears to be afraid to confess it here. But the "Introduction" clearly signifies a negative solution, since there he positively asserts that civilization is based upon two kinds of crime, one using cunning, and the other employing violence.

In the Appendix: "*Against Parliamentarism,*" Sighele points out that, even if the members of a parliament are the best men of a country, the result of such a government would be most unsatisfactory. This he bases upon the (rather doubtful) argument of Max Nordau, in the second chapter of his "Paradoxes:" "One may say that all men in a normal condition possess certain qualities which constitute a common value, identic, equal, we will say to x. Superior individuals possess an additional value; but this time it is of a different kind with each one; it must consequently be indicated in a different way in each case; we will say, for instance, that it is equal to b, c, d, etc. It follows, that, out of an assembly of twenty men, all of whom are geniuses of the highest order, there will be twenty x's, but only one b, one c, one d, etc., and the twenty x's will naturally outweigh the isolated b, c, d; in other words, the "general" in human nature will outweigh the individual personality, and the cap of the workingman will eclipse the hat of the physician, of the thinker, and of the philosopher. "Parliamentarism is the system of making laws by a majority, which majority represents the common level of the intelligence of a nation. Now, if the majority is to be considered as being right, then all progress may be looked upon as an impossibility.

These are the ideas exposed and upheld in the book. They are

[1] This classification is taken from Le Bon.

neither original, nor numerous, nor very deep. I do not see well why R. Worms has considered this work worthy of being translated and introduced into the "Bibliothèque Sociologique Internationale." 1. As for the lack of originality, it is necessary only to read Chapter III, where the old and well-known differences of views in the ethical judgment of a single man is as broadly exposed as if nobody had ever pointed it out before, or as if it were necessary to explain at length to a philosopher, that the deed of Charlotte Corday cannot be judged in the same way as an ordinary crime. 2. The scarcity of ideas becomes apparent by this summary. 3. I said that the book is not deep. As an example of this, the fact may serve, that Sighele thinks it necessary to demonstrate that the leader of a homogeneous association only exerts his influence upon members of his association, while the leader of a heterogeneous association, or a crowd, exerts his influence upon a less defined class of people (pp. 79-80). It must be added, that the author repeats himself so often, that it is tiresome to read him. An idea which would be amply treated in a single sentence is met with again and again. (See, for instance, p. 46 the difference between a *sect* and a *crowd*.)

Mr. Sighele, as Mr. Le Bon in France, has made a specialty of the study of the psychology of crowds. In a very high tone he claims for himself priority over Le Bon, and considers it wise to take up his polemic again in this book (p. 42). But putting aside the question of priority, I am sure that many will agree with me, that the "Psychologie des Foules," by Le Bon, is of far greater value than Sighele's works; Le Bon is truly a scientist, while Sighele is only an enthusiastic writer who dwells upon some few ideas with great volubility.

ALBERT SCHINZ.

Psychologie du Peuple Français, par ALFRED FOUILLÉE. (Bibliothèque de Philosophie Contemporaine. F. Alcan, Paris, 1898. pp. 388.)

Mr. Fouillée has added a new volume to his collection of books developing his favorite thesis of "*Ideés-Fortes*." His theory is plainly seen throughout the volume. Nationality should not be considered from a purely physiological, ethnological, or economical standpoint; above all it manifests itself in psychological characteristics: language, religion, poetry and art. Of late years too much importance has been attributed to physical causes, and the reaction of the intelligence and the will against the milieu has been too much neglected: "Men, and especially groups of the human society, adapt the milieu to themselves with as much facility as they adapt themselves to the milieu." (P. 56.) Owing to the intelligence of man, history of humanity cannot be reduced to natural history: "The milieu modifies the animal, but man modifies the milieu." (P. 56.) Book I is devoted to determining what races have united to form the French nation.

In Book II the character of the Gauls is described, and in Book III that of the present French nation. The resemblance between the two is striking. There is hardly a single feature of the Gauls, such as ancient writers mention, which is not again found in the modern inhabitants of France,—and one doubts, after all, whether the influence of the milieu, already noticed by Strabo, is not of greater importance than the authors seem to admit.

Book IV is entitled "Degeneration or Crisis?" Mr. Fouillée admits that France has come to a crisis; but contrary to many ethnologists of to-day, he does not admit any degeneration. There is no doubt that the nation is greatly attacked, but it is, as yet, not so weak as to

be unable to recuperate. Any delay, however, may have fatal consequences, and already the French are to blame for their negligence in finding remedies for the evils. The chapters on Alcoholism and on Depopulation are especially interesting.

In conclusion, I should like to say that, in reading his book, we must not forget that the author is French, and very fond of his country,—which accounts for his often too enthusiastic judgments. For instance, it seems strange that, from the Celts, from the Germans and from the Mediterraneans, the French adopted only the good qualities without ever being affected by the Cadones. The chapter on music will surprise every impartial reader, and expressions like "*Our* Alsace-Lorraine" are out of place in a scientific work.

ALBERT SCHINZ.

La Philosophie de Nietzsche, par H. LICHTENBERGER. Paris, Alcan, 1898. 182 pages.

There is hardly another thinker so difficult to truly understand, as is Nietzsche. His books are not, in our sense of the term, systematically written. His style is brilliant, but not always easy to grasp. Not one of his works contains the whole thought of the author. There is a great number of them (12 volumes published so far). Again, Nietzsche changed his views more than once, and one very often encounters contradictions in his writings. It is due to all this, for a great part at least, that the European critics totally misunderstood Nietzsche. A book like that of Mr. Lichtenberger would have prevented many unjust judgments. Nietzsche is now being studied in this country. I should be glad to see the little book I speak of, serve as an introdnction into the study of Nietzsche. If he will be found as interesting in this country as he was regarded in Europe, nothing could be more useful than a translation of Lichtenberger's work.

The origin of Nietzsche's ideas is very clearly exposed. Also, the transition from one period of thought to another. The rational ground of the dry and often hard and repelling paradoxes of Nietzsche, is especially well developed. As a rule, only short and startling maxims are attributed to Nietzsche. Isolated, away from their context, they not only sound strange, but seem to be the production of a mad mind. On the other hand, to read Nietzsche is, as I said before, a wearisome undertaking, or, rather, a difficult one. On reading the 182 pages of Lichtenberger's book, one will be able to see every one of these well-known quotations in their proper light, and one will no longer think only of attacking Nietzsche, but of reflecting upon the many problems he has treated in such an admirably original way.

I cannot but call attention to another merit of Lichtenberger's work. Nietzsche is exceedingly suggestive. It is therefore a very strong temptation for any one writing about him, to discuss him only, and not to explain and expose his ideas. Lichtenberger succeeded in putting Nietzsche forward and in keeping himself in the background.

ALBERT SCHINZ.

L'Art et le Réel. Essai de métaphysique fondée sur l'esthétique par JEAN PERRS. Paris, Alcan, 1898. 200 pages.

A listless after-stir of the great wave of transcendental idealism, to which a grain of theism is added; a feeble and indistinct echo of the æstheticism of Kant, of Schelling, and here and there of Hegel, modified by a Leibnitzian touch—that is all that can be said of the vague and indefinite work of Mr. Jean Pérès.

ALBERT SCHINZ.

CORRESPONDENCE.

The following letter was written with no thought whatever, on the part of Professor Garman, that it would ever be published. It was in answer to a personal letter which I addressed to the author requesting information for my own use. His experience and rare success in teaching philosophy, and the value that I myself derived from it, has prompted me to request him to permit me to print it for the benefit of others—which he has very kindly consented to allow me to do. It appears exactly as it was written, with no revision whatever.

G. STANLEY HALL,

Clark University, July 23-98.

AMHERST, MASS.

My Dear President Hall:

The problems that you propose in your letter of Feb. 8 interest me greatly, and I am very glad to have an opportunity to state to you my experience. It is a matter I have puzzled over much for the last eighteen years, and I am very far from feeling that the problem is solved yet. I have constantly altered my course and tried new experiments, but still the undergraduate is an uncertain quantity, and methods which secure a phenomenal success with one class meet with much resistance from others.

First, a word as to my methods of work. There seems to be an unavoidable resistance to new ideas on the part of students at this age, a resistance that during the last few years has increased. I have gradually settled down to the conviction that an introductory course ought to be so arranged as to meet this resistance most advantageously. This I have secured by two devices: first, the pamphlet system which I think is as much of an invention as printing by movable type. These pamphlets I have printed at my own expense; they are very fragmentary, taking up a single topic or part of a topic and treating it as one would in a lecture; these I loan to the students, and they return them for the use of the next class. In this way I can state a question without answering it by having them turn over to the next chapter of the book and find the answer given there. If I find the question is really appreciated, the effort is a success; if not, I must approach it from some other direction, by some other pamphlet which shall have enough new material to hold their thought and stimulate their inquiry, and yet, at the same time, focus their attention on the problem they have failed to appreciate. In this way I can keep the class at work and keep them moving, prevent their being taken up with outside occupations and amusements, and at the same time be reviewing more thoroughly work they have partially done. It requires as much skill to keep a class together in the introductory course, to give enough work for the best students and not too much for the less able as it does for the police to handle a large crowd at the time of a public celebration. I can do it with pamphlets, I cannot do it without. If I read lectures before the class to any extent they become spectators, but by means of the pamphlets they get the lecture before coming into the class room, and our time is spent in discussion.

My second device is the order in which our subjects are taken up. Years ago when I taught geometry I found that the students would often times make it a mere intellectual puzzle or mental gymnastics, but that by applying some of the problems to questions in surveying, in astronomy and physics, I could bring the men to realize that in studying geometry they were gaining citizenship in the universe, and they were at once led to interpret their lives as far as possible in terms of these propositions. In taking up philosophy I have attempted to do something of that same kind of work, I present the fundamental positions from the point of view of the history of the discussions in psychology, in philosophy and ethics, and to some extent of political obligations. It makes the matter as serious and personal as possible, and as a result it has often cost the students a very great effort to satisfy themselves instead of simply meet the requirements of the recitation room.

Now in answer to your particular questions I can only give very general impressions.

"1. Why is this (readjusting of their views) necessary, that is, what is it meant to accomplish?"—The earlier life of the students has been one of imitation and obedience to authority; it corresponds to traditionalism in tribal or national existence. The great requisite for a young person is to form habits. I have sometimes been asked to give lectures to the lower classmen on methods of work, and I think it would be very proper to do so, but I have more and more realized that students acquire right methods of work not through explanation but through imitation and discipline. I have had students completely carried away by my lectures on methods of work in the fall term, and declare that "if they had only known that freshman year it would have made such a difference with them," and yet in three months' time the entire effect had passed away, and they would do only what I forced them to do by actual drill. I am confident, therefore, that the earlier education of the student must be wholly by imitation, which should be more or less blind. But there comes a time when the young man must assume responsibility for what he does; there must be self-possession and self-direction instead of dependence on authority, and this is a new experience to him, an experience which many shrink from even in very little things.

Those who decline to follow this unfolding of their nature, and there are very many of them, begin to fossilize. If they are religious they soon become Pharisaical, get lost in particulars, are unable to discriminate the essential from the accidental, and take refuge in doing something, and their religious activity is often times such as exhibits zeal, but without knowledge. If they are not religious they become fastidious in imitating social customs, and very soon develop a degree of indifference towards everything except mere form; they become heartless, selfish, many cynical. There is no hope for a young man at this time if he does not meet the obligations of life with the spirit of self-reliance, but to do this he must have some confidence in his own judgment and the standards by which he judges. This is the spirit of philosophy.

A young man who does not have the spirit of philosophy grows up a woman minus her virtues, he can never have the intuitive power of a woman, but he is sure to have her sensitiveness, her vanity, her fickleness, and generally he will greatly exaggerate these qualities.

It is my conviction that a young man can obtain inspiration, enthusiasm, absence of self-consciousness only by the steady contemplation of great truths; that if he is wholly absorbed in imitation, he is like a person whose whole work is that of a proof reader; if he is

successful, he is taken as a matter of course, and he gets no credit; if he is unsuccessful and makes mistakes he is awkward, he is ridiculed beyond endurance; he soon realizes that the most promising rewards for the most careful efforts are negative, and he soon becomes indifferent, and is simply goaded on from fear of the consequences of failure. But the young man who philosophizes, who really understands himself and appreciates the truth is no longer a slave of form, but is filled with admiration that is genuine and lasting.

This, I believe, is exactly the issue which is settled at this critical period of a young man's life. But the question arises why should philosophy, psychology, and ethics be the studies which most favor self-reliance rather than mathematics or the sciences.

I have often raised the question as to whether I would not let down my course and take a little rest and devote myself to publishing, but I have found that somehow students' minds would be satisfied with nothing less than these most difficult problems. I did not awaken enthusiasm or gratitude until these were mastered, and so I have come to the conclusion that there is something in these subjects which the mind demands at this stage of the young man's development.

It seems to me that mathematics fails to meet the demand for two reasons; first, there is no difference of opinion on all these subjects, and the student does not really have to stand on his own feet; thus it may become more a discipline in ingenuity than in decision, self-reliance. Secondly; he often times knows pretty nearly what the answer will be, and therefore gets very decided hints as to the means, that is, he really has some guidance either from text books or from experience; he is not a Columbus sailing over unknown seas with everything before him untried.

With regard to the physical sciences; there is some difference of opinion here, but his main time is spent in undergraduate work on matters that are generally accepted; he has more or less assistance about the use of the apparatus, and his main consciousness of need is of ingenuity and of quickness, and then the enormous admiration which our age has for the discoveries of physical science give him almost a superstitious reverence for anything that can be called scientific. I mean by that that he accepts a great many positions in science without really testing them, and thus he almost gets back into the imitative work again; but when he comes to philosophy it is a new world, the trend of public opinion, especially of society life with which he is most familiar, is not in that direction; it requires something like the heroism which was demanded of Luther, and of the anti-slavery leaders for him to attempt the positions which even in an undergraduate study are forced upon his attention, and he cannot follow authority, there is so much difference of opinion. He is obliged, therefore, to weigh evidence and to let himself down with all his weight upon his own feet. It takes me six months to bring even the better men in the class up to a place where they will really weigh evidence; when their attention is called to it, the issue is forced and they are greatly surprised to find the extent to which they have blindly followed authority, they are almost as frightened as some horses are when the blinders are taken off. But when the idea fairly dawns upon them that true scholarship consists not in some mystical quality of genius which ordinary men do not possess, but in simple honesty to one's self in following out the Cartesian Golden Rule, then they experience a new birth, they are no longer boys or slaves, but men. If they attain citizenship in the kingdom of truth they perceive that the difference between the greatest and the smallest consists only in the quickness and comprehensiveness and thoroughness and humility of

their work. Truth to one man is truth to all if they can get exactly the same data and exactly the same standards. Henceforth, they call no man master or lord for all are brethren.

No doubt a similar development could be secured, if we could only have the right circumstances, by business responsibility, or military service, or by actual professional practice and training, but I think it would be pretty costly, and that the usual percentage of failures would be maintained. Philosophy has this advantage, that it gives the training under such circumstances that the best results can be secured with the least danger.

"2. How should it be guided, directed or controlled by the instructor, *i. e.*, what topics first and last; should it be deep going or drastic; are there dangers, and if so, how avoided?"—The first requisite is success. Power reveals itself only in work done; if the student gets confused and discouraged he is worse off than if he had not attempted to decide for himself.

It is my conviction that the introductory course should always be given by a teacher of the largest experience and greatest power of adaptation. I feel that when the student has learned to stand on his own feet and to weigh evidence thoroughly, and to avoid jumping at conclusions because they appear plausible, that he can be left to the guidance of the less experienced teacher, but that first acquaintance with philosophy is the grand opportunity, just like the breaking of a colt; carelessness here will vaccinate against future success.

The student needs to be taught first constructive thinking; he has been accustomed to a certain amount of analysis. All this, with rare exceptions, is clerical work. He will make a very good table of contents or the outline of a certain argument, but he takes the author's own estimate of each step of his position, and has no power to understand independent valuation. The first thing is to teach him that scholarship demands constructive criticism, and here we must begin with the easier subjects. In my own experience hypnotism is peculiarly favorable for this kind of work. I give them several recitations on the details of hypnotism up through double consciousness in Binet, etc., then I ask them to give me not an outline or table of contents, but such an argument as a judge would give when reviewing the case before a jury, telling them not to go into details, and not to jump at conclusions, and to give the extremes under each type. The papers I get back are a sight to behold. These I criticise, writing in corrections with red ink, and hand back, and then require them to try again. By this time they discover their mistake, but do not see how to remedy it, and then comes a great deal of very frank talk. Then they realize for the first time how much they are guided by authority and imitation and indeed begin to wonder if there is anything else in scholarship. Then I give them in very brief form my own argument, and then follows a most interesting series of comments which generally agree in this particular: "how could we be expected to have discovered anything like that in the reference-books?" and it very soon becomes formulated into the idea that the standards for undergraduate thinking ought not to be the same as that which is demanded of the teacher. In other words, there is a difference of kind between the teacher and the taught.

I believe the great secret is to take some one subject and make a success of that rather than to go from subject to subject. Hence, I work over this particular problem until the men come to see clearly that it is simply an unfolding process, and that they could have worked it out if they had only weighed evidence. We then take up a series of subjects in psychology, and show their ethical and practical

significance, and also the places which they have occupied in historical discussion. Each subject has a two-fold significance; first, it is not so difficult but that the students can, in time, realize just what constructive work here means. Secondly, each subject points in a particular direction, namely, towards the unity of our mental life, the fact that our practical activity is founded on our mental constitution: and the students are brought to realize that simple things are more complex than they seem, and therefore more thorough study will be demanded, purely from practical considerations if one has no higher motive. I feel that the work should be thorough or not touched at all. Some subjects may be merely referred to, but it is better to take one subject and do it thoroughly, and show the students what it involves, and the true methods, than give the results of investigation without giving the processes.

Just here I have to fight strenuously against the students using the class room as a pony; when a problem is given out and the data presented in the class room, they must attempt the solution for themselves, and not wait and get the results presented in the class room. Hence, I require frequent papers written on topics by the whole class before the discussion is completed in the recitation. By means of the pamphlets I am able to do this, but if the pamphlets were bound up in a volume the students would look over into the next chapter and save themselves trouble. The dangers that are most serious, in my judgment, are demoralization and discouragement, such as may come over an army in a panic. Students are very quick to suspect a sleight-at-hand performance on the part of the teacher, and that some other author could get just the opposite results, and instead of weighing evidence they fall back on ingenuity and sophistry. I believe every student has to go through a period of sophistry if he fairly faces this work, and I believe in having this fit of measles early and have it out of the way, but for some little time the teacher has got to be on the lookout for the sequelæ, and he must not trust too implicitly to students when they say they are through with them. They are quite likely to enjoy the position of uncertainty, and use it to justify themselves if they have any immoral tendencies, but if you can get the man so far along as to make him have confidence in the power of weighing evidence, to realize how much civilization owes to it, how every department of life can be progressive only through scientific thinking, and then make it a moral question, and show that intellectual honesty and supreme choice of truth for truth's sake, and determination to follow evidence to the best of one's ability, is the great line of cleavage between the saints and the sinners; if you can force the issue here and win, then the class are entirely different afterwards. I do not believe without this moral battle, without considering the ethical phases of the question, it would be possible to get the best intellectual results.

3. "What would be one or two good literary treatments of this question of epistemology, *i. e.*, is a course in Locke, Berkeley and Hume the best to begin with and is Kant a final solution?"

Having taken them through a discussion of some of the simpler questions in psychology, our work centers around the doctrine of association and habit as is presented by James, and the men are made to realize how much of our life has a physical basis, especially by the study of pathological cases. We now face the problem: is it all dependent on brain action? If so, what would be the consequences? Up to this point they have had the point of view of physics and the natural sciences. Epistemological work is fairly before us when we take up Berkeley. I should prefer Berkeley and the Sophists taken

up together. The great thing is to force upon a young man's mind a problem in all its seriousness. I do not feel that Locke is an economy of time for an introductory course unless some of the men hold to innate ideas. Therefore we begin with Berkeley, then take Hume with John Stuart Mill's additions, then selections from Spencer until we get before the student the problem of our standards of thought, whether these might not be wholly relative or due to association, and show what would be the effect on ethics and religion. Then we take up the study of reflex action, the automaton theory, and psychological problems. This brings the matter home to the students, till it seems as though physical habit (heredity and associations of ideas) would account for our most sacred convictions. The reason why I make this so strong is because at present there are very many outside enterprises distracting the students' attention. Unless philosophy is a life and death matter you will not get the thorough work, the hard work which the students really need to do. He soon gets a faith in the teacher, and that a man who is able to present so clearly the argument on a few points which they have had will be able to guide them on all the difficult ones, and that somehow they will come out right anyway. So when they get into the larger questions and do not see the bearing of some of the problems, they are in danger of making drudgery out of it instead of philosophy and so lose their inspiration.

Our next step is then to bring before them the questions: can the brain weigh evidence? Can the brain give us personal identity? Can the brain give us memory in the true sense of that word? Can we account for the existence of error if we have only brain action? Here we take up such discussions as are given in Clifford and James's "mind stuff," and review Herbert Spencer until the men clearly realize the position which Wundt brings out, that there must be such a thing as psychical causality. This comes to them like a revelation. We are then ready for Kant and at the same time for the study of particular questions in physiological psychology. Then the men see what the fusion of sense perceptions means, also what problems are at issue in space perception, for instance, or in time perceptions, and most of all in attention and volition. It does not seem to me that the main problems of experimental psychology should come at the beginning of the course; they surely get a double meaning when taken up at this stage.

4. "Is it possible to find the way out of agnosticism or could an ingenuous soul be left to wrestle with it?"

My feeling is if the best students have the right method of work and have the spirit of investigation, agnosticism would in time work itself out if left unsolved, but that the average student needs help, at least to this extent to show him that he cannot make any hypothesis which will be a reasonable basis for his knowledge of the physical world and of natural science that does not involve as its basis something more than the physical world. I believe the place to take this up is with Kant's Practical Reason, and if this is fully appreciated the students will find no great difficulty in theism, at least as the only hypothesis which gives any basis for science and human life. It is so easy for them to feel that our knowledge of the material world is simple, and our knowledge of moral obligation and of spiritual life a mere matter of opinion that I cannot content myself with leaving the class until they realize just the reverse. It is not very hard to make the students understand that our standards of thinking are spiritual, and that unless we can use these standards in judging others, and in interpreting nature, and in interpreting human life and human destiny we are guilty of the worst form of anthropom-

orphism, an anthropomorphism for which there is not the slightest justification. But with the application of these standards moral obligations are authoritative and society cannot dispense with them. The class derive great inspiration from this point of view. It converts them from disciples to apostles, and it helps them in every position of graduate work, in law, in literature, in theology, and in medicine. The business world is the severest trial, and yet nowhere do they need this point of view so much as when they are tempted to sacrifice everything to mere accumulation of wealth.

The great need of our students from a practical point of view is an ideal; the great danger is that they will become visionary. Hence, I cannot let them go until I hold out before them the ideals of a spiritual life, and then make such a practical application as will enable them to understand the evolution of religion, that is, how it was possible for a divine being to tolerate slavery, polygamy, etc., provided these are wrong. I show them that an ideal is like the north star which the colored slave would follow, not with the expectation of ever reaching the star but under the hope that by following it he might better his condition. I bring in the laws of unfolding of the life of the individual and of the community, until the men discover that the great question of human history is not so much "where we are as whither we are drifting," and that time is required for all progress. Without this discussion the men would at first be idealists and visionary and then get discouraged and wonder whether their college course had not been too optimistic, and whether finite human beings are not powerless to hasten the evolution of the race. This will lead to hope and lessen their indifference as citizens.

I fear I have wearied you by my long letter. I do feel that the teaching of philosophy is an opportunity which no other study offers. I feel that the student who has been through these doubts and worked them out for himself has learned the strength and at the same time the limitations of the finite, and that he will have a degree of courage and patience in adversity, a degree of self reliance and humility which others can secure only by those peculiar experiences which occasionally occur in actual business or politics, or the professional life. The student who has taken philosophy realizes how the part is to be estimated in the light of the whole, he realizes this more completely than he could from any other study. He also realizes the dignity which a part may secure from the grandeur of the whole to which it belongs, and that the little things in life have a depth of meaning for him which they could not have if he had not this point of view. There are considerably many who, in spite of all the teacher can do, use the class room as a pony, who, therefore, get only some of the benefits of the course, but it shows in all their other work. The habits that are formed in college are so persistent that the student does not readily change them after he goes out.

Hoping that I have not tired you by my long account, and that I have not given too much emphasis to the personal equation, I am

Most sincerely yours,

CHARLES E. GARMAN.

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ORIGINAL ARTICLES.

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I.—SUBJECT INDEX.

II.—Names of Authors.

(The names of those who have contributed original matter are printed in SMALL CAPITALS.)